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EDITORIAL

THE REPORT OF THE COUNCIL ON MEDICAL EDUCATION.

The current report of the Council on Medical Education is interesting in its review of medical progress in the United States in the past ten years. The student attendance at medical colleges has dropped 50% in this time, 28,142 in 1904 and 14,022 in 1916. There were 162 medical colleges in 1906 and since 1904, 94 have closed. There survive 82 regular schools and 13 irregular schools capable of classification. While medical schools have merged in a number of cities, there are still 8 in Chicago, 7 in New York and 5 in Philadelphia, though in Philadelphia the three leading schools have planned to merge.

Practically all schools rated in Class A will demand two years

of college work as an entrance requirement after January 1, 1918, as this time limit has been fixed by both the Council and by the Association of American Medical Colleges.

The number of graduates has naturally grown smaller under such rapid changes in standards and the decrease will probably go on until some adjustment takes place, for the practise of medicine is not nearly so attractive to the average individual as it was a few years back, when the way was easier; with twelve years of school, two years of college work and five years in the medical and hospital fulfilment, before practise can be undertaken, the total of nineteen years before the start can be made will act as a deterrent to many young men who might be inclined to go in this field.

The smaller number of physicians, on the other hand, will certainly benefit the survivors, except that already the gravitation of the better trained men to the large cities makes the competition greater and the reward smaller, while in the country places there is now the demand for practitioners—a demand also already not so easily satisfied.

There may be a logical adjustment of the supply and demand, coming probably only when the smaller communities have more to offer, for the modern study of medicine carries many incentives to the aggregation of the scientifically inclined and the continued advanced teaching in our medical schools will not prepare the medical student when graduated to undertake country practice. The question is not yet up for solution but may not be long deferred.

This discussion cannot detract from the good work done by the Council on Medical Education and the whole credit is due this body for a relentless activity in standardizing medical education—a result now assured and not likely to be altered in the years to come.

THE NEW ORLEANS CHARITY HOSPITAL.

During the last quarter of a century the administration of the New Orleans Charity Hospital has been the object of popular consideration and the nature of its control by political influences has always seemed to share, if it did not carry, the burden of responsibility for general criticism.

The Charity Hospital has probably for many years been an

outlet for gubernatorial patronage and the time has not passed too long for many to remember when the matter of the patient and the institution was of no real consideration so long as the political situation was properly adjusted.

The recent resignation of most of the remaining members of the old hospital board of administrators reminds us of former times when a clean sweep of the hospital board was made whenever it seemed necessary in the interest of the house surgeon in office.

It is really to be deplored that so obvious a partisan policy should have been followed by the new state administration, which should have resulted in the resignation from the hospital board of some of the best administrators the hospital has had in years.

Leaving the system of the hospital aside the outgoing board has to its credit the rehabilitation of the New Orleans Charity Hospital. Every member of the visiting staff will acknowledge a better service from the standpoint of either the patient or visiting staff; the intern staff does better work and the general public is certainly better served than ever before. Contagious diseases, including tuberculosis, have been provided for, and the hospital clinics are better attended, with a better result in public service as a whole.

A social service has been undertaken, and there is for the first time in many years a real department of pathology which not only has satisfied the hospital end of its operation, but has done statewide service in preventive medicine as well as in serum treatments, altogether netting an expense to the hospital less than the same department hitherto entailed.

The new board may profit by the experience of its predecessors and the new superintendent may not disturb the successful system inaugurated by his predecessor. We are hopeful for the continuance of the hospital management as revised in the last four years and we are sure that we voice the rest of the New Orleans profession in saying that any improvement will be welcomed and to that end we vouch our support—but, with such a remarkable showing by the board which has honorably served for the past four years, we earnestly trust that the improvements will be based upon a proven plan, for any step backward cannot help the hospital in any of its activities.

ORIGINAL ARTICLES

(No paper published or to be published in any other medical journal will be accepted for this department. All papers must be in the hands of the Editors on the tenth day of the month preceding that in which they are expected to appear. Reprints may be had at reasonable rates if a WRITTEN order for the same accompany the paper.)

HAY-FEVER IN LOUISIANA.

An Analysis of the Age, Sex, Occupations and Color of Hay-Fever Cases, with a Review of the Principal Causes.

By W. SCHEPPEGRELL, A. M., M. D.,

President, American Hay-Fever-Prevention Association, New Orleans.

At the request of the American Hay-Fever-Prevention Association, Dr. Oscar Dowling, President of the Louisiana State Board of Health, sent a list of questions regarding hay-fever to all the physicians of this State. These were issued under the authority of the United States Public Health Service.

The answers represent a good proportion of the physicians of the State and establish some interesting points. As this is the first general statistical information that has thus far been obtained regarding hay-fever, a careful analysis should be of interest.

The answers indicate that the percentage of hay-fever in North Louisiana is 8-9 of 1 per cent, and in South Louisiana 1 per cent, or approximately 1 per cent (0.94) for the State. The estimate which has been made by our research department of hay-fever cases in New Orleans is also about 1 per cent.

The average percentage of hay-fever cases in Louisiana and the Gulf Coast generally is somewhat lower than in other sections of the United States East of Kansas, where the rag-weeds (Ambrosias) are found. This is due to the fact that the common rag-weed (*Ambrosia trifida*), which is prevalent through this section of the United States, is replaced on the Gulf Coast by the giant rag-weed. While the pollen of this is spiculated similar to that of the common rag-weed and gives the same form of hay-fever, its larger size reduces its potential area. The common rag-weed measures 15 microns* in diameter and the giant rag-weed,

*Micron is one-thousandth of a millimeter.

20 microns, the latter being two and one-half times the weight of the former. As this is the important factor in the convention of pollen by the wind, this gives the *A. trifida* a much smaller potential area. Under wind conditions that the common rag-weed would traverse one-half mile, the giant rag-weed will traverse only one-quarter mile. The common rag-weed, therefore, has a potential area four times greater (square) than the giant rag-weed.

The percentage of asthma complicating hay-fever was found unexpectedly large, being 30 per cent of the total number.

The seasons in which hay-fever appears most in Louisiana is also about the same as in other parts of the United States below the 35th parallel, but differs materially from those in higher latitudes. As in other sections, August and September are the most common months (67%), October, however, being also included in this State. The cases at this season are due almost entirely (85%) to the rag-weeds, the common (*Ambrosia elatior*) or giant rag-weed (*Ambrosia trifida*) being responsible, according to the humidity of the soil and the proximity to the Gulf. Where the one is prevalent the other is usually infrequent. In New Orleans and its vicinity, the giant rag-weed (*trifida*) is the principal cause of fall hay-fever, to the practical exclusion of the common rag-weed.

May, June and July form the next most common season (24%). The hay-fever cases during these months are almost entirely due to the grasses, the most common being the Bull grass (*Paspalum dilatum* and *vasyanum*), Bermuda grass (*Capriola dactylon*), Carpet grass (*Paspalum conjugatum*), Smut grass)*Sporobolus indicus*), Johnson grass (*Andropogon halapense*), Lace grass (*Eragrostis conferta*) Canary grass (*Phlaris canarienis*) and Crab grass (*Panicum sanguinale*).

February, March and April have only 7% of the hay-fever cases, these being due principally to the early grasses, such as the June grass (*Poa annua*), Scotch rye grass (*Lollium perenne*), etc., although at this season the Curly Dock (*Rumex crispus*) and Plantain (*Plantago*) are also in bloom. The amount of pollen in the air at this season, however, is comparatively small and the attacks of hay-fever are usually of a mild character, and limited to cases in close proximity to the source of infection.

In New Orleans there is a type of hay-fever (2%) that is found all the year, which is principally due to the False Wormwood (*Parthenium hysterophorus*), this being florescent practically every month of the year. It has a spiculated pollen of the same size as the Trifida rag-weed (20 microns) and gives the same type of direct hay-fever, the only difference being the color of the pollen which is white instead of yellow as in the rag-weeds. The amount of pollen, however, is not very great as compared with the Ambrosias, and the tendency of the pollen to adhere in bunches of one hundred or more, gives it a restricted potential area. It is therefore not responsible for many cases of hay-fever, but these may develop at any time of the year.

Regarding the age at which hay-fever develops, this was found to be most common between 20 to 40 years (62%), the next most common age being from 10 to 20 (17%). . The principal age corresponds with the time of life that a man enters his life's occupation, when he is usually more exposed to the hay-fever pollens. Hay-fever in children, however, is frequently mistaken for "colds" and this percentage will probably be readjusted when this condition is better recognized.

The pollens considered most responsible for hay-fever in Louisiana correspond remarkably with our recent investigations, considering the comparatively late date of the acceptance of the pollen theory of hay-fever. About 70% (69) were attributed to the rag-weeds and golden rod. The latter not being wind-pollinated, however, is not a cause of ordinary hay-fever, and may be omitted. The grasses were considered responsible for 11%, which is too low an estimate due to the relation of the grass pollens to hay-fever not yet being fully understood. Corn and rice were held responsible for 2% of the cases. Since corn belongs to the order of *Gramineæ* and is high in protein, it is also a source of hay-fever, the large size of its pollen, however, greatly reducing its potential area. It measures 80 microns in diameter as compared with 15 microns of the common rag-weed, as a result of which the latter would traverse one-half mile under the same wind conditions that the corn pollen would traverse only 43 feet. Oats is also given as a cause by two physicians, but as this is not wind-pollinated it does not cause hay-fever. The only cereals which may cause hay-fever are corn, rye and rice.

The report on occupations is one of the most interesting results of this questionnaire. It is commonly supposed that persons in the country suffer little from hay-fever, and the alleged fact that farmers do not suffer from this disease is often used as an argument against the pollen theory of hay-fever. This investigation, however, demonstrates that the occupation which has the largest number of hay-fever cases (38%) is that of the farmer. As they are most exposed to the pollen, this is only natural, and shows that the greater resistance due to their out-door life is offset by the still greater exposure.

The proportion of males and females having hay-fever is probably due not so much to difference of susceptibility as of exposure. The males have 63 % of the hay-fever cases against 37% of the females, the difference being probably due to the men being more exposed to hay-fever pollen by their occupations.

Another interesting point is the proportion of colored persons who suffer from hay-fever. Most reports and books on the subject refer to the rarity of hay-fever in the colored race. The answers show that the proportion of white and colored are 79% and 21% respectively. As the United States Census shows that there were 713,874 colored to 941,086 white persons in Louisiana, this indicates that the colored are affected with hay-fever about one-third as often as the whites..

We have considered constitutional causes as a predisposing factor in hay-fever as being effective only to the extent of lowering the normal resistance, without being otherwise an important consideration. This was corroborated by the answers, in which fifty-four physicians reported forty-eight different predisposing constitutional causes of hay-fever!

The statistics on hay-fever have heretofore been very vague and indefinite and the synopsis of these answers, which give definite information on many parts of this subject, should be of interest not only in Louisiana but in the United States generally.

EPIDURAL, CAUDAL OR SACRAL ANESTHESIA.

By CARROLL W. ALLEN, M. D., New Orleans.

In connection with spinal and para-vertebral anesthesia, should be considered the epidural injections of Cathelin. Cathelin first conceived the idea of medicating the pelvic nerves in the sacral canal for the relief of various pelvic neuroses, especially neuralgia of the lower half of the trunk, incontinence of urine and sexual neuroses. He later tried the method for the purpose of inducing anesthesia, but met with little success.

The technic of Cathelin's injections were practically the same as those employed to-day for surgical purposes. The solutions which he used were either plain water or salt solution alone, or containing an appropriate quantity of cocain, novocain, codein or morphin; 6 or 8 ounces or more were injected. The method of its action is hard to explain, but seems to be due to the physical influence, as well as such chemical changes as may be induced by bathing the nerves in this space in the injected solution.

Cathelin and his associates reported a large number of cases treated by this method, and, in incontinence of urine, reported 49% cured, 35% materially improved and 4% failures. It was occasionally necessary to repeat the injections several times.

The method had been used in a desultory way from time to time for purposes of anesthesia. Stockel met with somewhat more success in this direction, but it was not until Lawen's paper in 1910 that the method attracted any serious attention.

Anatomy: The dural sac ends opposite the lower border of the second sacral segment; the terminal bundles of the cauda equina pass through the dural sac into the sacral canal on their way to the sacral foramina through which they pass to form the sacral plexus consisting principally of the sciatic, vesical and pudic nerves. The sacral canal also contains the sacral plexus of veins and much loose cellular tissue through which passes the filum terminalis of the cord.

The lower end of the sacrum, which most interests us, presents a notch or triangle due to the lack of development of the spinous processes, on the lower extremity of each side of the triangle is a bony prominence, the sacral cornu, which articulates with the coccyx.

At the apex of this triangle is found the sacral hiatus, a bony

canal, which opens into the sacral canal; the triangle is covered with the sacro-coccygeal ligament which closes the sacral hiatus. The sacral canal is flattened from before backward and progressively diminishes in size from above downward, following the general curve of the sacrum, which is always more marked in the male.

The hiatus varies much in size, but is nearly always large enough to permit the ready passage of the needle.

The distance from the sacral hiatus to the dural sac is from 6 to 9 cm.

The nerves in the sacral canal are identical with peripheral nerves and in reaching them with anesthetic solutions in this position they are affected the same as perineural injections made around nerve plexuses in other parts. The method is essentially different from spinal anesthesia, in which the injection is made into the dural sac and is confined within it, being distributed by the spinal fluid; in sacral injections while the fluid injected may ascend the vertebral canal between the dura and vertebra for a considerable distance, it is also escaping from the canal in all directions through the numerous foramina.

Another essential difference is that in spinal injections but a few minims of solution is used containing usually less than one grain of the anesthetic agent, while in sacral injections 30, 40 or 60 cc. of solution may be used containing 4 or 5 grains of anesthetic.

Solutions: Lawen's success was due to the use of large quantites of more concentrated solutions, 20 to 25 cc. of 1½ to 2% solutions of novocain, he made the injection in the sitting position and had the patient remain in that position for some minutes to retain the solution at the lower end of the vertebral canal. He was able to report fairly constant results. Gras recommended the addition of sodium bicarbonate, which he states permits the solution to more readily penetrate the nerve sheaths. Two solutions were used:

Sodium chloride	0.1
Sodium bicarbonate	0.15
Novocain	0.6

dissolved in 30 cc. of water. 20 to 30 cc. of this solution, which

is 2% novocain, are injected; or a slightly larger quantity of the following, 1½% novocain may be used—

Sodium chloride 0.2
Sodium bicarbonate 0.2
Novocain 0.75

dissolved in 50 cc. of water.

The solutions are first boiled for a few seconds just before use, which converts a part of it into carbonate, increasing its efficiency, due to its increased hydrolytic action. After cooling 5 to 10 drops of a 1 to 1,000 adrenalin solution are added.

Strauss prepares a solution by the addition of sodium sulphate, which he claims prevents the decomposition of adrenalin.

Harris, who has had much experience with this method, claims that the efficiency of the solution is increased by the addition of ¼ to ½% calcium chloride to a 1% novocain solution, adding about 10 drops of adrenalin 1:1000 before injection. 30 to 40 cc. are used.

While the author has used these various salts in the anesthetic solution which he has employed, owing to the inevitable failure of a certain number of all cases I have not felt certain that the efficiency was increased, but am inclined to believe that the calcium chloride solution is the more effective.

If any additions are to be made to the anesthetic solution, it would seem to the author that gelatin has some claims for recognition. Muroya has shown in experiments on rabbits that 5% gelatin in the solution delays its absorption from the point of injection and thus increases its efficiency. I have recently been using this in my injections, but am not yet prepared to make a positive statement as to its advantages. Certainly the large amount of cellular tissue in the sacral canal would seem favorable to its action. The free space in the sacral canal can at most not exceed a few drams and the large amount of solution injected 20, 30 and 40 cc. must escape up the vertebral canal and through the sacral foramina in all directions.

Hertzler recommends the use of quinin and urea using from 60 to 80 cc of a .6% solution. I have had no experience with this agent and would offer the same objections to its use here as in other parts of the body.

The cause of occasional failures (10 to 15%) is explained by

the difficulty of having anesthetic solutions when injected perineurally, penetrate effectively all parts of the nerve trunks. Sacral anesthesia is essentially peri-neural anesthesia. About the same percentage of failures is noted in all perineural injections where the nerves are of any size as in Kulenkampff's injection of the brachial plexus. The same may be more readily observed when injecting the ulnar nerve at the elbow; unless the needle be made to penetrate the nerve the anesthesia is uncertain. The delay necessary to produce anesthesia (20 to 30 minutes) is similarly explained.

Any method of anesthesia that shows 10% faliures can not become universally popular, but if some means can be determined to make it practically a certainty, the method will undoubtedly gain great popularity.

It is possible in considering the above that the use of much smaller but more concentrated quantities of solution containing 5% gelatin, which the author is now using, may improve these results.

In clinical experience so far slightly better results have followed the use of larger quantities of weaker solutions, 80 to 90 cc of ½% solutions; the pressure effect exerted by the larger quantity of fluid as well as its greater diffusibility has favorably influenced the results, although there still remains in excess of 10% failures.

Technic: The patient should lie on either side near the edge of the table, with the limbs drawn up. I find lying on the right side more convenient.

The last sacral spine is palpated with the left hand; immediately below this is the sacral triangle with the hiatus at its apex above. The skin and subcutaneous tissue over this region is anesthetised with a small syringe and fine needle, using the same solution intended for the injection. The large syringe and long needle are now used, the needle entered about one inch below the last sacral spine and advanced upward in the direction of the sacral canal injecting as the needle is advanced searching for the sacral hiatus. This is usually located without much difficulty in thin subjects by gently feeling the way with the point of the needle. In very stout subjects more difficulty may be encountered, and, when difficult to locate, I find a convenient

aid in placing the left index finger in the rectum outlining the coccyx and lower end of the sacrum. With the finger in this position, the needle can more easily be passed up over the base of the coccyx and sacrum, seeking the opening. When found, the needle is gently pushed up for a distance of two or three inches injecting as it is advanced. When well within the canal, the needle point should convey the sensation of being in a free space. Care should be taken not to enter any veins or the termination of the dural sac. This last is unlikely at this depth, but both should be insured against by gentle aspiration before making the injection, and if found to have entered either a vein or the dural sac, the needle should be slightly withdrawn and redirected at a different angle. When freely within the sacral canal as the needle is being advanced, it is advisable to depress the syringe slightly forward, thus directing the point of the needle toward the back of the sacral canal to avoid wounding the nerves which lie more in front.

Lawen prefers to make the injection with the patient in a sitting position with the back near the side of the table, in much the same position as is used for spinal puncture. The sacral triangle is outlined and an imaginary line drawn from its apex to base and the needle entered at the middle of this line, advancing it upward in the recognized direction. These landmarks are, however, not easily located in stout individuals and the position is not a convenient one. I much prefer to use the technic as outlined above. When well within the canal, the solution should be slowly injected; detaching the syringe from the needle for refilling as occasion requires. While making the injections, the patient will occasionally complain of pains in the legs, which are transient and should cause no concern. If this or other complaints are made, the injection should be given more slowly or stopped for a few minutes.

Toxic symptoms when they occur are no different than when using the same agents elsewhere. Lawen has used as much as 5 grains of novocain here, but as these injections should be regarded as slightly more toxic then subcutaneous infiltrations, these large doses should be cautiously used, as here the entire quantity is thrown into a free space at one time and it is well to reserve a margin of safety, both to avoid toxic effects and in

the event of failure in anesthesia, which occurs in 10 to 15% of cases, to permit the use of direct injections into the field of operation should the case be suited to it.

Having made the injection, the patient is turned on his back to permit the uniform distribution of the anesthetic to both sides of the sacral canal; otherwise a one-sided anesthesia may result.

The field can now be prepared while waiting for the anesthesia to be well established, which takes from 10 to 20 minutes, though at times slightly longer.

Extent of Anesthesia: The full anesthetic influence in exerted on the smaller nerves of the sacral plexus and the few terminal filaments which make up the coccygeal plexus.

The great sciatic is only occasionally affected and rarely completely anesthetised. The principal nerves most constantly anesthetised are the pudic, small sciatic with its inferior pudendal branch, the vesical nerve and ooher small branches. This group of nerves gives us anesthesia of the lower part of the rectum, perineum, vaginal floor, posterior half of the coverings of the external genitalia, the bladder, prostate, penis and clitoris; the anterior scrotal skin, scrotal contents and anterior portion of the vulva in the female are not anesthetised, as the nerve supply is from the ilio-inguinal and genito-crural. The upper part of the vagina and uterus usually escape the anesthesia, as their nerve supply is partly from the lower lumbar region. At times with a higher ascent of the anesthetic along the vertebral canal, some of the parts usually exempt are brought under its influence. This ascent of anesthesia may be favorably influenced by using the Trendelenburg position, in which the anesthesia may ascend as high as the umbilicus, but when this is done the degree of anesthesia is less certain.

The order in which the anesthesia usually manifests itself is, first in the parts supplied by the coccygeal plexus, then the anus and anal canal, perineum and lastly the penis or clitoris, and disappears in the reverse order, the coccyx the last to feel pain.

The duration of anesthesia varies within wide limits. When a good surgical anesthesia has been secured, the minimum time is usually 45 minutes, and it may last as long as two hours.

As is common with all local and regional methods, complete muscular relaxation is noted in the parts affected due to the

absence of all reflexes as well as to a certain amount of motor paralysis. This is a decided advantage and permits the more ready handling and retraction of the parts. The complete muscular relaxation in addition to the anesthesia, has prompted its use in labor, particularly in old primipara, where it is often used to great advantage if properly timed to meet the head at the perineum. For this purpose it is usually given when the head is well engaged in the pelvis. It does not seem to affect the progress or intensity of the pains.

Surgical Applications: In addition to the original therapeutic uses as suggested by Cathelin and its employment in labor, it finds a ready field of usefulness in many surgical procedures. All operations in the ischio-rectal region and lower end of the rectum, including its resection, perineorrhaphy, internal and external urethrotomy and all operations upon the penis, passage of sounds, cystoscopy and all intra-vesical operations, such as the destruction of growths by electricity, perineal prostatectomy and suprapubic prostatectomy when combined with infiltration for the supra-pubic incision.

Complications and after Effects: These are few and as a rule of no serious concern, aside from possible infection, which should be regarded as due to improper technic. The only serious consequences can result from the use of a toxic quantity of the anesthetic. Motor paralysis which sometimes may occur, possesses no disadvantage, except in such cases as cystoscopy, etc., where the patient may be forced to remain recumbent for an hour or more.

While this method is still in its infancy, it has already gained a wide range of popularity and as it possesses none of the disadvantages or dangers of spinal anesthesia, it will probably be developed to a high state of efficiency. The injection is not made, however, with the same ease or certainty as spinal puncture, but requires some little practice. The element of uncertainty, 10 to 15% failures, and delay before anesthesia, 10 to 30 minutes, operates considerably against its universal adoption. Further experience will no doubt largely eliminate these objections. As used at present, the best results are obtained by the use of large quantities of weak solution 40 to 50 cc of ½% novocain injected high in the canal.

HERNIAS OF THE URINARY BLADDER.*

By AIME PAUL HEINECK, Professor of Surgery Chicago College of Medicine and Surgery, Surgeon to Rhodes Ave., Jefferson Park and Frances Willard Hospitals.

The permanent or temporary escape of a part or the whole of the urinary bladder, through any of the usual or unusual hernial orifices, is uncommon. Nevertheless, many cases have been published and a much larger number have been allowed to pass without record. In a long series of hernia operations, every surgeon is certain to meet with some instances of hernia of the bladder.

Though the term hernia implies the presence of a hernial opening, of a sac, sac-contents and sac-coverings, we know that in many hernias of the urinary bladder the sac is either incomplete or totally absent.

To designate the clinical entity under consideration, we fail to find any other term more appropriate, more sanctioned by long usage than that of hernia of the urinary bladder.

Our deficient knowledge of this pathological lesion is responsible for many unfortunate and, at times, fatal accidents.

Many operators have unknowingly punctured, incised, ligated or removed a herniated bladder-process and then closed the hernial canal and operative wound in the usual way. Bladder protrusions have been excised by mistake for hernial sacs, or stitches used to close hernial canals have been passed too deeply and found at the necropsy to have caught the bladder.

The urinary bladder in part or in its entirety is present in 1% of all hernias.

As vaginal bladder hernias fall more appropriately within the domain of the gynecologist, we decided not to include them in this contribution. All the hernias herein considered were external hernias, that is, their outermost overlying saccular covering was skin; each after reaching a certain stage of development, gave rise to a more or less visible and palpable, external swelling in the obturator, femoral, inguinal or other region, depending upon the anatomical location of the hernia.

*This article is based on an analysis of all the vesical hernias reported with sufficient data in the English, French and German languages from 1896 to 1914, inclusive (literature to which access can be had at the John Crerar Library, Chicago, Illinois), and also on some unpublished personal cases (one hundred and fifty-nine patients, representing one hundred and sixty-four vesical hernias).

We will discuss the subject under the following sub-heads:

1. Incidence as to age,
   as to sex,
   as to side involved.
2. Anatomical types.
3. Clinical types.
4. Etiology.
5. Symptomatology.
6. Clinical manifestations.
7. Operative findings.
8. Diagnosis.
9. Treatment.
10. Conclusions.

Incidence as to Age.

It was not possible, in most cases, to ascertain the age at which the hernia first appeared. We therefore tabulated the age of the patients at the time of operative relief. In three cases, the patient's age at time of operation is not or is indefinitely stated (a young man; a multipara). The other patients at time of operation were from:

16 to 25 years old..... 9 cases.
26 to 35 years old..... 27 cases.
36 to 45 years old..... 31 cases.
46 to 55 years old..... 36 cases.
56 to 65 years old..... 19 cases.
66 to 75 years old..... 15 cases.
76 to 80 years old..... 5 cases.

Our personal clinical observation and a review of the literature justify the following conclusions as to age incidence of hernias of the urinary bladder:

a. They are extremely rare in infancy, childhood and adolescence. During the first year of life, not one patient, and previous to the sixteenth year, only thirteen patients are reported to have been operated for hernia of the urinary bladder.

b. They are most frequent after the fortieth year of life. Ninety-one patients out of one hundred and fifty-nine unselected consecutive herniated individuals were operated for the relief of this condition during the fifth and subsequent decades of life. Five of these patients, each presented a right and a left vesical hernia.

c. Hernia of the bladder is an infirmity occurring chiefly in advanced life.

Incidence as to Sex.

Hernias of the urinary bladder, like all hernias of viscera common to both sexes, are found more frequently in males. The one hundred and sixty-four hernias herein studied and analyzed were distributed as follows: Masculine pseudohermaphrodite, 1 case; females, 62 cases; males, 96 cases.

Case reports show that, in the female, these hernias occur in nulliparæ, in primiparæ and in multiparæ. They first become manifest either before, during, or after gestation, or between successive pregnancies.

In looking over the cases, we find that vesical hernias have occurred in:

1-para	5 times.
2-para	3 times.
3-para	2 times.
4-para	1 time.
6-para	1 time.
8-para	2 times.
9-para	1 time.
14-para	1 time.
Multipara	3 times.

In the other female subjects, no definite statement is made as to pregnancy.

Incidence as to Side Involved.

Most hernias of the urinary bladder are unilateral. Out of one hundred and fifty-nine patients suffering from this infirmity, only five presented double vesical hernias. In thirty-seven females and fifty-one males, the hernia was on the right side; in seventeen females and forty-one, it was on the left side. We thus see that hernias of the urinary bladder show in both sexes a noticeable predilection for the right side.

In bilateral hernias, both hernias either appear simultaneously, or, as is more frequent, an interval of time, measured in weeks, months or years, elapses between the appearance of the first and that of the second hernia.

Anatomical Types.

Hernias of the urinary bladder appear at various anatomical sites. Indirect or oblique inguinal hernias escape from the abdomino-pelvic cavity, above Poupart's ligament, by way of the external inguinal fossa, and follow in their progress outward the

course of the spermatic cord in the male, or of the round ligament in the female. They are complete or incomplete, according as the herniated viscus or viscera emerge or not beyond the external opening of the hernial canal. The complete are pudendal or scrotal. In the former the hernial swelling descends into a labium majus; in the latter into a scrotal pouch.

Direct inguinal hernias escape from the abdominal cavity by emerging through either the middle or the internal inguinal fossa and first appear externally at the superficial abdominal ring. Direct inguinal hernias are always to the inner or medial side of the deep epigastric vessels, and, unlike the indirect, do not follow the entire course of the inguinal canal.

In our cases, we find twenty-seven patients with direct inguinal hernias and eighty-seven with indirect or oblique inguinal hernias. Of the twenty-seven patients with direct inguinal hernias, five were females. Direct hernias are very rare in the young. Thirteen of the eighty-seven patients with indirect or oblique inguinal hernias were females.

In our list of cases, there were forty-two femoral hernias, forty of which occurred in female patients and two in males.

What precedes shows that:

a. Inguinal vesical hernias are more common in men than in women.

b. Femoral vesical hernias are far more common in women than in men.

c. Femoral hernias of the urinary bladder are an exception to the general rule, which is that inguinal hernias are more frequent in women than femoral hernias. Forty female patients presented femoral vesical hernias and only seventeen presented inguinal vesical hernias.

d. Direct inguinal vesical hernias are of frequent occurrence. Out of one hundred and fourteen inguinal vesical hernias, twenty-seven were of the direct variety, that is, in twenty-seven cases the herniated bladder-process was to the inner side of the deep epigastric artery.

Gladstone's case of left obturator extra-peritoneal bladder hernia is the only obturator vesical hernia reported in the period covered by this paper. It coexisted with a right obturator tubal

hernia of the third variety and a right reducible femoral intestinal hernia.

Gerulanos' and Tédenat's cases were irreducible supra-pubic hernias of the linea alba, consisting solely of a prolapsed bladder diverticulum. In these two cases, both of which occurred in eight paras, the pedicle of the hernial swelling passed above the upper surface of the symphysis pubis, and had emerged from the abdominal cavity through round orifice between the two recti muscles.

According to the relation which the bladder protrusion bears to the peritoneum, hernias of the urinary bladder are classified into the following three varieties:

a. Intra-peritoneal, in which there is a complete hernial sac.

b. Para-peritoneal, in which the herniated bladder-process is covered by peritoneum on one surface.

c. Extra-peritoneal, in which the herniated portion of the bladder is neither engaged in nor contiguous to a hernial sac.

In the intra-peritoneal variety, the herniated portion of the bladder has a complete peritoneal covering and is contained in a true hernial sac. In the para-peritoneal variety, the herniated bladder-process lies to the inner side of the sac, and its serous covering enters in part into the formation of the hernial sac. Part of the herniated bladder-process has no peritoneal covering. The para-peritoneal form is not uncommonly a sliding hernia, and is frequently due to a continuous pull and traction exerted by the sac of an existing enterocele, epiplocele or entero-epiplocele upon the peritoneal covering of the urinary bladder. In the extra-peritoneal variety, the herniated bladder-process has no peritoneal covering. The prolapsed bladder is neither present in nor does it enter into the formation of a hernial sac. The extra-peritoneal bladder-protrusion is in relation with the subcutaneous tissues and is always distinct from and to the inner side of the hernial sac, if one be present.

In the one hundred and sixty-four reported cases, the hernia is definitely stated to have been:

Intra-peritoneal in 4 cases (females, 1 case).

Para-peritoneal in 53 cases (females, 21 cases).

Extra-peritoneal in 58 cases (females, 22 cases).

In the cases not included in the above tabulation, the relation

of the herniated bladder-process to the hernial sac, when one was present, is not precisely recorded.

Clinical Types.

Any hernia of the bladder, be it intra-peritoneal, para-peritoneal or extra-peritoneal, may be reducible, inflamed, obstructed or strangulated.

If the contents of a hernial sac return spontaneously to or can be manipulated back into the abdominal cavity from which they have escaped, the hernia is said to be reducible. At first most vesical hernias are reducible; the larger number, sooner or later, become irreducible. Reduction of hernial contents, spontaneous or manual, may be temporary, may be permanent, and is effected with more or less difficulty (general anesthesia may be required). In our collected cases, there were forty-eight hernias, the contents of which could be completely reduced. Sixteen of these occurred in female subjects.

If the hernial sac-contents cannot be manipulated back into the abdominal cavity, the hernia is said to be irreducible, provided that the irreducibility *per se* does not cause any functional disturbance of the herniated organ or organs, and none or but slight interference with the blood supply thereof. The irreducibility may be recent or of long duration. Partial or complete irreducibility predisposes to inflammation, obstruction and strangulation, and is either of sudden or of gradual onset. We noted fifty-eight irreducible vesical hernias, twenty-one of which occurred in females.

If communication between the herniated and the non-herniated portion of the bladder be more or less interfered with, the urinary bladder being transformed, in some instances, into a bissac, the hernia is said to be obstructed.

If, in addition to irreducibility of the sac-contents, the blood supply of the herniated organ or organs is interfered with to such a degree that their vitality is endangered or lost, the hernia is said to be strangulated. Strangulation may follow a paroxysm of cough, heavy lifting, a fall, any strong muscular effort associated with great sudden increase of intra-abdominal pressure. There were twenty-two strangulated hernias, eleven of which occurred in females. In some cases, the hernia of the bladder exists alone and becomes strangulated. In some of these strang-

ulated cases, the vesical hernia was associated with an enterocele, an epiplocele or an entero-epiplocele, the bladder was not constricted and the herniated omentum or intestine or both were strangulated. In others, the bladder was strangulated and the herniated omentum, intestine or both were not constricted. Bladder-wall offers more resistance to constriction than intestine. Strangulation of the bladder is especially grave if renal disease coexists.

Etiology.

The etiology of these hernias is largely the etiology of hernias in general. In the causation of this pathological lesion, the following factors are of importance:

A. All conditions that tend to increase intra-abdominal pressure.

1. Occupations necessitating repeated muscular efforts associated with increased intra-abdominal tension, as the lifting or pushing of heavy weights, etc. (over twenty cases in our series).

2. Physiological or pathological states which distend the abdominal cavity, stretching the abdominal parietes, and widening the orifices normally present in the muscular and aponeurotic layers of the abdominal wall (enteroptosis, obesity, abdominal tumors, ascites, pregnancy, etc.).

3. All diseases associated with frequently repeated increase of intra-abdominal pressure (long-standing lung affection, pulmonary emphysema, chronic bronchitis, habitual constipation, etc.).

B. All conditions which weaken the abdominal wall.

1. Acute or chronic diseases debilitating the organism, especially such as cause great emaciation.

2. Obesity weakens the abdominal wall and increases the intra-abdominal pressure.

3. Traumatism. Most often the traumatism does not cause the hernia, but only reveals its existence (abdominal operations). Pathologic adhesions of viscera or omentum to the anterior parietal peritoneal wall near a hernia opening may act as a predisposing cause.

4. Previous hernia operations.

5. Enteroceles, epiploceles and entero-epiploceles.

6. Feeble development or atrophy of the aponeurosis of the

transversalis muscle and of the conjoined tendon. This factor is of great importance in direct inguinal hernia.

7. Unduly large hernia rings.
8. Excessive breadth of hernial canal.
9. Congenital defects present in abdominal wall.
10. Inherited or acquired weakness of abdominal wall.
11. Pre-existing hernial sacs of pre-and post-natal formation.

C. All conditions associated with prolonged over-distention, over-stretching, impaired contractibility, restricted mobility, etc., of the urinary bladder.

1. Congenital malformations of the bladder.
2. Diseases of the lower urinary organs, impairing the expulsive force of the bladder or abnormally hindering the outflow of urine (vesical catarrh, prostatic hypertrophy, urethral stricture, phimosis, etc.).
3. Abnormal increase of the peri-vesical fatty connective tissue (lipome pre-vesical).

Symptomatology.

Hernias of the urinary bladder are congenital or acquired, recent or recurrent, and of greater or shorter standing. They vary in shape, volume, rate of growth and in amount of discomfort and disability entailed. Occasionally they occur at the site of a previous hernia operation.

Hernia of the bladder is usually an acquired condition. It occurs most commonly in late adult life and is, not infrequently, secondary to pelvic, vesical and urethral diseases. Twenty-seven patients presented direct inguinal hernias. Direct inguinal hernias are said to always be acquired hernias. Forty-two patients presented femoral hernias, excepting one case, that of a five-year-old female child and reported by the author to be an acquired hernia. All these femoral hernias first became manifest in adult life. Congenital femoral hernias are pathological rarities. Femoral hernia is essentially a hernia of adult life. Congenital hernias appear at all periods of life. Even at the time of operation, one may be unable to differentiate between a sac of pro-natal and one of post-natal formation.

Size is variable. A few of the reported hernias simply pointed; some were hazelnut-sized, lima bean-sized, pigeon egg-sized, goose egg-sized; others had the volume of a fist, of two fists, of

a fœtal head. In many, the hernial swelling is said to have been large, voluminous.

The hernial swelling may be cylindrical, ovoid, elongated-ovoid; it may be grooved or bilobed, soft, elastic and fluctuating or hard and non-elastic. The hernial swelling may be a large, tense, smooth tumor, may occupy the scrotum, may extend as far as the middle of the femur, may occupy the entire left labia, distorting the vaginal opening.

The size of the hernia is liable to rapid and considerable changes, being influenced by clinical type of hernia, position of body, amount of urine present in bladder, etc. The hernial swelling may be a large, tense, smooth tumor, may occupy the scrotum, may extend as far as the middle of the femur, may occupy the entire left labia, distorting the vaginal opening.

The size of the hernia is liable to rapid and considerable changes, being influenced by clinical type of hernia, position of body, amount of urine present in bladder, etc. The hernial swelling gives a dull or tympanitic percussion note.

Pain is an inconstant symptom. Ten of the reported cases are said to have been painless.

Diverse urinary disturbances (subjective and objective) may be present. These disturbances may be occasional or constant.

Subjective: Frequent urination; painful urination; pain at close of urination; difficult urination. Patient, in order to urinate, may find it necessary to elevate or to compress the scrotum and its contents, or to, both, elevate and compress the scrotal contents. These patients sometimes resort to unusual positions to empty their bladder: dorsal decubitus. In a few cases, on account of the narrowing or compression of the joining isthmus, considerable difficulty is experienced in emptying the scrotal portion of the bladder into the pelvic portion.

Vesical tenesmus. Pressure upon hernial swelling gives desire to urinate; burning on urination.

Objective: Increase of swelling with accumulation of urine, decrease with voiding; two-step urination (Miction á deux temps) (is associated with a simultaneous lessening of the hernial swelling).

The injection of fluid into the bladder causes an increase in size of the hernial swelling. A sound introduced into bladder

may enter the herniated bladder-process. A cystoscope introduced into bladder may show the round contour of the normal bladder distorted into T-shape, may show the vesical opening of the herniated bladder-process, etc.

Vesical hernias may exist alone, may be one of two or more hernias, coexisting with a hernia of other organ or organs on the same or opposite side of the body. Other congenital or acquired anomalies may be present: phimosis, ectopia testis, inguinalis, cryptorchism, vaginal cystocele, hydrocele, prolapsus uteri, hydrocele of hernial sac, etc.

Pathology.

In many cases, note is made of excessive breadth of hernial canal, of enlarged hernial rings. The spermatic cord may be to the outer side of the hernial swelling, may be spread out over the hernial sac, may be behind sac, may be below and external to sac, may be spread out over bladder (anterior and outer surfaces).

To differentiate a hernial sac of pre-natal formation from one of post-natal formation is at times difficult, at times impossible.

Acquired hernial sacs, except in hernias *"par glissement,"* are always entirely derived from the parietal peritoneum.

Sac may be thin or thick, congested and infiltrated, intimately adherent to the spermatic cord, and, not uncommonly, is capped by a thick mass of fatty tissue.

An extra-peritoneal bladder hernia has no serous hernial sac. A pseudo-sac, consisting of connective tissue, overlies the herniated bladder-process. This connective tissue may be much attenuated or much thickened.

There may be an unusual amount of fat in the hernial canal. In the extra- and para-peritoneal forms, the herniated bladder-process is frequently covered with fatty tissue, the *"lipome herniaire"* of the French authors. This pre-vesical accumulation of fatty tissue is thought by many to be an important contributory etiological factor.

In the para-peritoneal hernias, the serous sac is, at one point, intimately adherent to the bladder-wall. In the para- and also in the extra-peritoneal types, if a sac be present, the bladder is always to its inner, to its medial side, and, at times, below. The

bladder may be adherent to the hernial sac, may be adherent to the spermatic cord.

Amount of viscus present in hernial swelling may be small, may be large. In some cases, the hernial swelling consists solely of the herniated bladder-process and of the increased amount of fatty tissues overlying it; in other cases, fifteen in our series, of the herniated bladder-process or bladder-diverticulum and of an empty serous hernial sac. In a large number of cases, the hernial swelling includes a herniated bladder-process and a distinct or contiguous serous hernial sac with or without sac-contents. The hernial sac-contents may be hernial fluid, a part of right ureter, omentum, small intestine, large intestine, intestine and omentum, small and large intestine.

In the strangulated cases, we note such contents as the following: Hemorrhagic fluid and the bladder, bloody fluid, gut and ovary; a loop of congested intestine and urinary bladder; congested bluish appendix epiploica; reddish-brown fluid, bladder-diverticulum and small intestine.

The wall of the herniated bladder-process may be normal, thinned or thickened. The herniated bladder-process may present the appearance of an empty or of a thickened hernial sac. Its cavity communicates with the cavity of the non-herniated portion of the bladder by means of a wide or narrow channel. It may be the seat of tuberculous disease, of carcinomatous disease. Calculi may be present in the herniated and in the non-herniated portion of the bladder.

The spermatic cord is sometimes found spread out over the vesical hernia, at times is distinct from it, and often is in close relation with coexisting enterocele, epiplocele, or entero-epiplocele.

Diagnosis and Differential Diagnosis.

The existence of a hernia of the urinary bladder may be ignored, suspected or diagnosed before operation. The diagnosis may first be made at time of operation, or not before one or more days after operation. Evidence of the bladder having been wounded may not be present until some time after the patient has left the operating table. It has happened to eminent clinicians to fail to recognize even in operated cases the true state of affairs previous to the autopsy.

Before operation, the following symptoms are suggestive of vesical hernias:

1. Urinary disturbances: dysuria, two-stage urination, frequent urination, scalding urination.

2. A hernial swelling, pressure upon which causes a desire to urinate, and which increases in volume with urinary retention, and markedly diminishes in size with urination.

3. A hernial swelling, the size of which is increased by air- or water-distention of the urinary bladder.

4. A hernial swelling in which fluctuation is detected or in which a metallic sound con be introduced by way of the urethra.

5. A hernial swelling, in which, after easy reduction of most of the contents, there persists a small doughy mass representing the extruded part of the bladder.

During the course of a hernia operation, the following symptoms or signs are suggestive of vesical hernias:

1. An unusual amount of fat in the neighborhood of a hernial swelling.

2. Difficulty in finding or in isolating the true hernial sac from the tumor mass.

3. The trabeculated appearance of the bladder muscularis.

4. Large-sized external hernial opening and the fact that hernias of the bladder are usually nearer the median line than true hernial sacs.

5. The occurrence of a second hernial sac is so rare that it is a safe rule to regard as the urinary bladder, until proved otherwise, any structure resembling a second hernial sac.

6. The pedicle of a herniated bladder-process leads down behind the pubic bone into the true pelvis; the pedicle of a true hernial sac leads to the general peritoneal cavity.

Passage of sound into a cystocele, cystoscopic confirmation of its existence, escape of urine following wounding of bladder (thirty-one cases), all these are conclusive signs.

Keep in mind that vesical hernias are frequently associated with intestinal and omental hernias.

Injury of the bladder may not be noticed at the time of operation, and be diagnosed, for the first time, several hours after operation by:

a. Voluntary voiding or withdrawal by catheter of blood-stained urine.

b. Urine escaping from the hernial operative wound. This is usually preceded by the development and subsequent rupture or incision of a urinary phlegmon.

c. Sepsis due to urinary extravasation.

d. Peritonitis due to escape of urine into peritoneal cavity.

Treatment.

In discussing the treatment, we will limit ourselves to the consideration of femoral and inguinal hernias.

An operator not on his guard, may incise the bladder under the belief that he is opening a hernial sac. In operating upon recurrent hernias, guard against wounding the bladder. If isolation of the hernial sac from the inner lower portion of the ring be difficult, involvement of the bladder is to be suspected. Avoid this injury by securing a good exposure of the operative field. The more exact the stripping of the sac, quite up to the deep epigastric artery, the more likely will cystocele, especially in its earlier stages be discovered.

Vesical hernias can be produced by traction upon the sac and efforts to place the ligature high up may, if one be careless, result in catching in its bite the bladder-wall.

The bladder was accidentally injured in sixty-eight of the cases under consideration. In thirty-one, urine escaped into the operative field at time of operation.

Should the bladder be incised or otherwise injured, carefully suture it and provide appropriate drainage. Immediate closure of the bladder wound is of primary importance. It is effected by two, in some cases, by three layers of interrupted or continuous sutures. Introduce your bladder-sutures so as to include all the layers of the bladder-wall, the mucosa excepted. Needless to say that only absorbable suture-material is to be employed. Even if the bladder be not opened, but merely injured, it is safer to fortify the weak spot by the introduction of a few catgut sutures.

The herniated urinary bladder-process may be:

a. Injured in attempts to carefully and cautiously separate surrounding adhesions. Not only must one be careful as to sac-contents, but also as to contiguous tissues.

b. Torn accidentally in trying to separate it from the hernial sac. The herniated bladder-process is more liable to be injured if it be the seat of such changes as are incident to strangulation.

c. Punctured or pricked in suturing walls of hernial canal, in closing hernial orifice.

d. Incised or ligated and cut off, being mistaken for a hernial sac.

Resection of the herniated bladder-process is indicated only if it be very much attenuated, necrotic or the seat of other serious degenerative changes. Resection is to be followed by suture of the bladder-wound. If a calculus or calculi be present in the bladder protrusion, incise the bladder-wall, remove the foreign body, and repair vesical wound secundum artem. As a routine procedure, resection of the bladder protrusion is not to be recommended. It was performed only in twelve of the reported cases.

If the bladder protrusion be apparently normal, free it from surrounding adhesions, if any be present, and then reduce it into the abdomino-pelvic cavity. As a routine procedure, bladder repair, bladder resection and bladder reduction are always to be supplemented by resection of the abdominal wall. After isolation of the herniated bladder-process, supplemented by the repair of any injury which it may have sustained during the course of the operative procedure, we advise that the bladder be reduced into the abdominal cavity.

Vesical hernias have been successfully operated for radical cure without anesthesia, under local, cocain infiltration, spinal and general surgical anesthesia: nitrous oxide gas and oxygen, chloroform and ether (the majority of cases).

For inguinal hernias, the Bassini operation, with or without transplantation of the cord seems to be the operation most universally employed; it was employed forty-one times. Czerny's, Andrews', Ferguson's, Halsted's and Kocher's type of operation were each employed once. Numerous other methods were employed.

Various types of operations were employed in the femoral hernias (Berger, Coley, Lotheissen's operations, etc.). Some operators closed the hernial sac by a ligature, others by a purse-string suture, others by suturing the edges. In eighteen cases, it is stated that the hernial canal was freed of fatty tissue.

In all the cases in which the herniated bladder-process was not injured, in practically all those cases in which it was injured and repaired or resected and sutured, the organ, after being freed from surrounding adhesions, was returned into the abdominal cavity. Bernhard, in one case, after suturing the bladder, fixed it to the lower angle of the abdominal wound.

Operators are not agreed as to the advisability of using a permanent catheter after bladder suture, nor as to the time during which this permanent catheter, if used, should be left in the bladder. Some leave it in one day; some, two days; some, three days; some, four days; some, five days; some, six days; some, one week; some, two weeks.

Drainage extending to the bladder wound is a prudent provision against leakage from the sutured bladder. Many operators prefer, after bladder suture, to leave the abdominal wound open at its lower angle, and to close it as soon as conditions warrant.

If the hernial swelling contains, in addition to a bladder-process, a knuckle of gut, a piece of omentum or some other viscus, the indication is to first free and reduce the bladder-process, and then carefully isolate, incise and inspect the hernial sac contents. In the absence of contraindications, all hernial sac-contents, sac-fluid excepted, are to be returned into the cavity from which they have escaped.

A deviation from this rule is indicated in cases:

a. In which herniated omentum has undergone such inflammatory, cystic or other changes, that, if returned into the abdominal cavity, it might act as a foreign body.

b. In which the herniated gut or omentum is gangrenous or of doubtful viability.

c. In which the hernial contents are in such a pathological state that their return to the abdominal cavity would jeopardize the patient's life.

The treatment of the sac-contents does not differ from that which obtains in hernial swellings in which no bladder-process is present; if those contents are injured by the surgeon, the injury calls for repair.

Results.

Operations for the radical cure of vesical hernias have practically no mortality. What mortality occurs is due either to con-

comitant circumstances: extreme old age, great debility, shock, long-standing strangulation and unrecognized bladder injuries.

One of these hernias was a dissecting-room discovery; this leaves one hundred and sixty-three hernias occurring in one hundred and fifty-eight subjects. There were twelve deaths; all the other patients recovered.

Operations for the radical cure of vesical hernias are rarely followed by disagreeable sequelæ. In thirteen cases, a urinary fistula complicated convalescence. These urinary fistulæ usually closed spontaneously. One can, if he so desires, close these fistulæ under cocaine anesthesia.

A careful study of the cases in which death occurred shows that operations for the radical cure of vesical hernias have no mortality per se, if all bladder injuries be suitably repaired. In bladder hernias, recognized either previous to or at time of operation, before closure of the abdominal wound, recovery, of necessity, is rapid and uneventful.

Conclusions.

1. The urinary bladder, in part or in its entirety, may escape from the abdominal and abdomino-pelvic cavities through any of the uncommon or common hernial orifices of the lower abdominal wall.

2. Hernias of the urinary bladder occur in both sexes, at all ages, and in all races. They are congenital or acquired, recurrent, recent or of some standing; almost always unilateral, very rarely bilateral. Like other hernias, they vary in shape, size, rate of growth and in the discomfort and disability which they entail.

3. In the female, vesical hernias occur in nulliparæ, primiparæ and multiparæ; they occur previous to, during, or after gestation and between gestations. They neither interfere with gestation nor disturb parturition.

4. According to anatomical site, vesical hernias are designated as hernias of the linea alba, of the obturator, femoral or inguinal regions. Anatomical relations justify the further subdividing of the latter into interstitial or intra-parietal, direct or indirect, complete or incomplete, pudendal or scrotal.

5. The relation of the herniated bladder-process to the serous membrane lining the peritoneal cavity is well expressed by the

terms: Intra-peritoneal, para-peritoneal and extra-peritoneal. These designations are serviceable from the viewpoint of etiology, symptomatology and treatment.

6. According to clinical manifestations, hernias of the urinary bladder are reducible, irreducible, inflamed or strangulated.

7. A vesical hernia may be single, double, or one of two or more hernias located on the same or opposite side of the body, having dissimilar contents, and presenting like or unlike anatomical and clinical characteristics. Thus, the same patient may present an inguinal cystocele and a femoral epiplocele, a reducible femoral vesical hernia and an irreducible inguinal intestinal hernia. Case reports of an inguinal vesical hernia on one side coexisting with an inguinal enterocele, epiplocele or entero-epiplocele on opposite side of the body are not uncommon.

8. As etiological factors, in the causation of vesical hernias, the following are foremost:

a. All conditions that tend to increase intra-abdominal pressure.

b. All conditions, congenital or acquired, that weaken the abdominal wall.

c. All diseases of the lower urinary organs that impair the expulsive force of the bladder or abnormally hinder the outflow of urine.

d. Pre-existing hernias and hernial sacs of pre- or post-natal origin.

9. The pre-operative signs and symptoms may be unmistakable, vague or absolutely wanting. In addition to such symptoms as are common to all other hernias, vesical hernias present peculiar suggestive and positive manifestations of their existence. Chief among the former are such disturbances of micturition as the following: Frequent, painful and difficult urination, vesical tenesmus, urgent desire to urinate caused by pressure upon hernial swelling and two-step urination. Chief among the positive manifestations are: A hernial swelling increasing in size with urinary retention and decreasing with urination; increasing in size of a hernial swelling with air or water-distention of the bladder and decreasing upon withdrawal of these agents; passage of a sound into the herniated bladder-process by way of

urethra and bladder; cystoscopic demonstration of the vesical orifice of the herniated bladder-process.

10. The herniated bladder-process may be the sole content of the hernial swelling, or merely one of the associated contents. In addition to a bladder-process, a hernial swelling may contain a part of one or more of the following organs: Ureter, Fallopian tube, ovary, appendix vermiformis or appendix epiploicæ, omentum, and small or large intestine.

11. The herniated bladder-process may be free or adherent to surrounding tissues or organs, structurally normal or present degenerative, inflammatory or neoplastic changes; may be the seat of atrophy, hypertrophy, catarrh, gangrene, tuberculosis or carcinoma, and may or may not communicate freely with the general vesical cavity. The herniated process of bladder may contain one or more calculi.

12. The vesical hernia may be the sole existing anomaly, or it may be one of two or more, congenital or acquired, pathological states, having or not having any relationship of cause or effect to the hernia (cryptorchism, vaginal cystocele, prolapsus uteri, prostatic hypertrophy, etc.).

13. Truss treatment for hernias of the bladder is not curative, is often productive of discomfort and may injuriously affect the structure of the bladder-wall.

14. In patients over ten years of age, all hernias, irrespective of anatomical site, clinical condition or contents, should, in the absence of a constitutional state contra-indicating operations of election, be subjected to an operation for radical cure.

15. Clinical conditions so closely simulating hernias of the urinary bladder that a positive diagnosis without operation appears impossible, should be subjected to operative treatment. Only benefit can be derived from adherence to this rule. A diagnosis is established and a cure is effected.

16. All hernias of the urinary bladder, irrespective of sex, age or social condition of patient, irrespective of size, shape, anatomical site or clinical type, call for operative treatment. Operative treatment is free from danger and is curative. The only contra-indications to operative treatment are: Extreme old age and the co-existence of a pathological state or states contra-

indicating operation of election. Operative treatment is the only rational treatment of hernia in the adult.

17. In all incarcerated and in all strangulated hernias of the bladder, operative intervention is indicated.

18. In all hernias, the ideal time for operation is previous to the development of degenerative or other pathological changes in the herniated organ or organs and previous to the occurrence of any of the various complications incident to hernias.

19. Women who suffer from any form of hernia should be carefully watched before, during and after their confinement, so as to prevent or rather minimize any undue strain upon weak regions of the abdominal wall. Those women, at the close of lactation or towards the end of the first year following their confinement, should, in the absence of contra-indications, be subjected to an operation for radical cure of the hernia. In the female, the inguinal rings are comparatively small. They can without inconvenience to the patient be closed.

20. The most popular and efficient modern hernia operations permit a full view of operative field and allow such a careful examination of hernial rings, canals, and surrounding structures, that a prolapsed or herniated viscus rarely escapes detection.

21. In inguinal and femoral hernia operations, after careful opening and isolation of the sac, see that the latter consists preferably of peritoneum only, and that its neck be freed from all other structures. Neck of sac should not be twisted, as by so doing the bladder is drawn towards the hernial opening and is liable to be included in the ligature. Necrosis and peritonitis result therefrom.

22. In the course of a hernia operation, if, after opening the sac and reduction of its contents, there appears a second sac, it is not to be opened, unless the introduction of a sound in the bladder shows the complete independence of this sac from the urinary reservoir.

23. In hernias of the urinary bladder, first expose and free the herniated organ or organs, and then reduce it into the abdomino-pelvic cavity. Follow this by suppressing the hernial sac if one be present, and then strengthen, according to an approved method, the weakened hernial area. Resection of the herniated bladder-process is only exceptionally indicated. When

performed, it calls for immediate reconstitution of the urinary reservoir.

24. During hernia operations, the wounding of the urinary bladder can, to a large extent, be prevented by careful operating and by keeping in mind that this clinical entity occurs.

25. Wounds of the urinary bladder inflicted during the course of hernia operations give a good prognosis if they be immediately accurately repaired and if the post-operative treatment be instituted appropriately. In the repair of bladder-wounds, two or three layers of continuous or interrupted absorbable sutures give satisfactory results. Bladder suturing is to be followed by resection of the abdominal wall of the hernial area.

26. If within twenty-four to forty-eight hours after a hernia operation on a healthy subject the catheterized urine contains blood, determine the origin of the blood. If a bladder-injury be present, open the hernial operative wound or laparotomize or do both and repair the injury.

27. The mortality of operations for the radical cure of hernia, if performed at an opportune time by a rapid and skilful operator competently assisted, is practically nil. Coley operated 1,000 consecutive cases of hernia without a single death.

28. The operative treatment of hernias of the urinary bladder is highly satisfactory.

THE SURGICAL ASPECTS OF INFANTILE PARALYSIS.*

By E. D. FENNER, M. D., New Orleans.

The surgical treatment of the Protean deformities which result from poliomyelitis is a fascinating field of work. While it is certainly true that no case in which nerve centers in the cord have been destroyed can ever be made perfect, it is equally true that there are very few cases, no matter how helpless they may appear, which cannot be improved by well chosen and properly timed orthopedic measures.

The medical and the orthopedic treatment of infantile paralysis inevitably overlap each other, unless we are to consider that the medical treatment of these cases should end with the

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termination of the acute stage of onset, or, at least wtih the period of spontaneous regeneration of muscle activity.

To this borderland of disputed authority belong the measures intended to assist in the recovery of muscles not permanently paralyzed—strychnin, hydro-therapy, electricity, massage, passive, assisted, and active motion (muscle training). In addition, it might be considered as much the duty of the physician as of the surgeon to apply splints, or even braces, to maintain the normal attitude of the limbs and prevent the development of deformity. Inasmuch as it is the business of the orthopedic surgeon not only to ameliorate, to cure, but also to prevent bodily deformity, all of the measures named above are a part of the surgical treatment of infantile paralysis.

It is my own conviction that the above measures are of value in the order in which they are given. The benefit to be derived from the use of strychnin is to my mind problematical. A long and patient trial of electricity has resulted in an attitude of decided skepticism as to its definite influence. Massage and muscle training have appeared to me to be of very much greater value. Hydrotherapy is, of course, a minor matter. The use of splints and of braces to maintain the normal attitude of the parts, is a part of the treatment of poliomyelitis whose importance cannot be over-emphasized, but which it but too generally neglected.

The deformities following infantile paralysis are the result of a number of factors, acting either independently or together. Thus we recognize: 1. The influence of the force of gravity, the pressure of bed-clothing, and the weight of the part itself, as in certain cases of paralytic drop-foot. 2. Adaptative shortening of the tissues as a result of prolonged assumption of one position, as, for instance, in those cases of contracture about the hip so often seen in children who cannot walk at all, but spend most of their time in the "tailor's posture." 3. Stretching of the muscles which have been paralyzed. 4. Unopposed action of healthy and powerful muscles whose antagonists have been destroyed or weakened by the disease. 5. Retarded development of the bones, the result of trophic disturbances, and in certain cases shortening and deformity due to paralytic dislocations, as seen at the hip and shoulder joints.

In the vast majority of cases several of these factors co-operate in the production of deformity, as for instance, in a case where the peroneal group has been paralyzed, the weight of the body, the absence of the normal support of the peronei, and the unopposed pull of the tibials combine to produce a valgus deformity.

In the surgical treatment of the disabilities and deformities of infantile paralysis there can be no question that the ideal to be striven for is to obtain a stable, symmetrical and useful limb, without the need of any brace support. Braces are unsightly, cumbersome, expensive and hard to keep in repair, and while it is true that there are many cases in which they cannot be dispensed with, there are a great many more who can be made independent of braces by proper operative procedures. It is fortunate for the patients that poliomyelitis exhibits so marked a selection for the spinal cord segments supplying the lower extremities, and with such comparative infrequency destroys the function of the muscles of the trunk, and of the upper extremity. Any surgeon who has had to deal with a paralytic scoliosis, or with a paralysis of the arm (in the vast majority of cases of the Erb type), knows how gloomy is the prognosis for improvement of the condition, and, in the case of the spine, particularly, for preventing the advance of an incorrigible deformity. As for the upper extremity, deformity is seldom conspicuous, but the loss of function is as a rule permanent and intractable. The vast majority of the cases present involvement of the lower limbs, and it is here that surgery is capable of doing a great deal of good.

Opinion is now crystallized that operative interference is not wise until the chronic stage is well established; in other words, not until at least a year, and preferably two years have elapsed since the onset of the disease. There are, of course, exceptions to this, as there are to every rule. For instance, I do not think there could be any question as to the wisdom of a simple tenotomy of the tendo Achilles, even though the poliomyelitic infection were but six months past, where a severe contraction, producing a talipes equinus, had been permitted to develop. The justification of such a violation of the general rule is two-fold: 1. If the deformity is permitted to go on, not only the tendo

Achilles, but the ligaments and other structures are likely to undergo adaptative shortening, which may readily be prevented if the normal relation of the foot to the leg is restored by the simple section of the tendo Achilles. 2. It is a well established axiom, long ago emphasized by Tubby and Jones, that muscles which are simply weakened, or paretic, soon become practically paralyzed if constantly stretched, whereas their vitality may be restored by simply putting them in an attitude of relaxation. In such a case as I have cited, therefore, the tenotomy is conservative in that it not only prevents adaptative shortening on the posterior aspect of the limb, but may permit a very remarkable regeneration of the anterior group of muscles.

Equally well established is the opinion that the prognosis for permanent benefit from operation is better in the adolescent than in the very young child. It is the consensus of opinion that radical procedures are better postponed until the patient is seven or eight years old, our efforts in the younger patients being directed to the prevention of deformity, and the development of such muscular power as still remains by the regular use of electricity, massage, muscle training, and the support of suitable braces. In this way the patient may be tided along until the ultimate and permanent stage has been fully established. I do not mean by this that no cases under eight years of age should be submitted to operation, because there are many circumstances which not only justify intervention at an earlier age, but which clearly demand that surgical assistance should be given. My own opinion is that age may be disregarded in those cases in which you cannot hope to maintain any supervision to detect the development of deformity, in those in whom it is evident that even a well applied brace cannot be expected to prevent the development of deformity, and in those cases in whom deformity is already present, and in whom early operation may permit functional use of the limb, and prevent the development of permanent bone changes under the operation of Wolff's Law. It is to be borne in mind that even though the result be not permanent, an operation done in early life may arrest or delay deformity until the patient has reached an age when more radical procedures may be resorted to with success.

The operative procedures which are commonly employed in poliomyelitis include:

1. Manual stretching to overcome bony deformity, just as we use it in the correction of congenital club-foot.

2. Tenotomy, either the simple sub-cutaneous tenotomy, or by the method of Bayer, in which the tendon is punctured at its middle and one-half cut through, when a second puncture about 1½ inches higher is made and the opposite half sectioned. A quick and strong stretching force will now permit of "sliding" of the two halves upon each other.

3. Tendon lengthening through an open incision is a little more complicated, but serves the same purpose as tenotomy. It may be done by the Z-method of Bayer, with suture of the divided ends of the tendon, or by the reversed "double L" method, in which the continuity of the tendon is not destroyed and no sutures are required. Either tenotomy or tendon lengthening may permit the restoration of a normal attitude, but neither can be expected to restore muscle balance or stability unless supplemented by other measures.

4. Tendon shortening, either by taking a tuck, or by removing a section of the tendon, is of little value, since the paralyzed muscles are sure to yield again. It is occasionally employed in connection with arthrodesis, or tendon transplantation.

5. Tenodesis, or tendon fixation, was long ago recommended by Hoffa, and others, but had fallen into practical oblivion until recently revived by Gaillie. In this operation the paralyzed tendon is exposed and freed from its sheath, and after being pulled up until the foot is in a corrected position, is firmly anchored in a deep groove chiseled in the bone near by. Originally Gaillie advised that only tendons whose muscular belly was completely and permanently paralyzed should be used for fixation, but recently he has extended its use to muscles which are only partially paralyzed by splitting the tendon and fixing only half of it in the bony groove. In talipes calcaneus, the fixation of half of the tendo Achilles corrects the deformity, gives stability to the foot in walking, and by relaxing the uncut portion of the tendon, permits the muscle to recover from the effects of constant overstretching. Ryerson has in a late article described a modification of Gaillie's technic whereby still greater stability

is obtained by not only burying the tendon in the bony groove, but cutting it in two high up, and passing the upper end of the buried tendon through a whole in the bone, turning down the end and suturing it firmly to the portion lying in the groove.

Tenodesis seems to me one of the efficient measures. It takes advantage of natural structures, whose function has been entirely destroyed, and introduces no foreign material.

6. Artificial silk ligaments (extra-articular and intra-articular) have been employed for the same purposes as tenodesis. My own experience with this procedure has led me to the conclusion that it is not to be relied on by itself, but it may be a valuable adjuvant to tendon transplantation, or even to tenodesis.

7. Arthrodesis is one of the most reliable operations for the improvement of a flail ankle. It is not to be employed in cases less than 8 years old because a large percentage of failures to secure a stiff ankle will be recorded in younger patients. In a number of cases not only the tibio-astragaloid joint but the astragalo-scaphoid articulation should be dealt with. Arthrodesis is also sometimes employed in one-sided disability at the hip, and in cases of flail shoulder, but in neither of these is it as reliable as in the ankle.

8. Astragalectomy is Whitman's panacea for calcaneus deformity, one of the most troublesome of all the distortions of the foot. It has been widely used, and has given admirable results not only in calcaneo-valgus, for which Whitman originally advised it, but in other severe conditions at the ankle.

9. Tendon transplantation, either alone or in combination with one of the other procedures, is undoubtedly the operation to which we turn in the largest number of cases, where a group of muscles on one side of the limb is paralyzed while its antagonists are strong and active. We cannot but be attracted by an operation which strives to replace the deficiency on one side by subtracting from the excess on the other. Unfortunately the extravagant hopes of the pioneers in this work have been greatly curtailed by time and experience, but in spite of this very decided benefit may be gotten in properly selected cases. This type of operation is applicable in many situations; at the foot, the knee, the wrist, the shoulder. And the number and variety of the individual transplantations which may be found useful is too

great to permit their enumeration here.

10. Nerve transplantation, whereby it is hoped to restore the innervation of the paralyzed nerve and the muscles it supplies is undoubtedly the ideal operation for the relief of infantile paralysis. Success here means a *"restitutio ad integram,"* but the indications which would justify the operation are so seldom present, and the number of failures has been so large that it must still be regarded as a desideratum and not a practical resource. I have myself attempted nerve transplantation in a few cases. The operation I considered justified for the following reasons: 1. The entire muscular distribution of the nerve transplanted was paralyzed, so that section of the nerve could not cause any increase in the paralysis. 2. The adjacent recipient nerve trunk was healthy. In one of my cases I was successful. The patient, a little girl of four years, had had an attack of poliomyelitis when about 16 months old. In the beginning both lower limbs, and the right arm were affected, but the lower limbs had practically recovered. The arm paralysis, of the Erb type remained permanent. She had good motion in the hand and wrist, except for supination, but the elbow and shoulder were helpless. I exposed the musculo-cutaneous nerve in the axilla, cut it across, and implanted the distal end in a slit in the median. The anastomosis was wrapped in Cargile membrane, and the wound closed. There was union by first intention. In about a month there appeared to be slight contractility of the biceps. Several years after the operation the child's mother reported to me that she was able to flex and extend the elbow. The shoulder, of course, was not improved in any way.

11. Finally, there may arise in certain cases indications for other operations. Paralytic dislocation of the hip is by no means uncommon, and this may be combatted either by incision and suture with stout silk of the distended capsule, or by an arthrodesis. At the shoulder similar procedures may be justified for the improvement of flail or dislocated shoulder. Albee in his recent work on Bone Graft Surgery, recommends the insertion of a bone graft into the transverse processes for the relief of paralytic scoliosis. Whether the operation has been really successful in enough cases to justify its general adoption I do not

know, but I have not been able to avoid the suspicion that Albee has been influenced by the enthusiasm which is so natural in a man who has devoted himself so energetically to this particular kind of work.

TREATMENT OF PNEUMONIA WITH PHYLACOGEN.*

By J. B. ANDERSON, M. D., Yazoo City, Miss.

Pneumonia is still one of the most fatal of the acute infectious diseases. The mortality remains very high whether in private or hospital practice and varies within wide limits, being from 15 to 60 per cent, influenced by the character of the epidemic and the virulence of the infection. When alcoholics and the very aged are stricken they rarely recover, and often the death rate runs high among vigorous, young adults. Pneumonia therapy remains to-day about what it has been for the past several decades. We have no drug that even approaches a specific, and the research laboratories and workers are yet looking for an immunizing agent or antitoxin that they hope will be a specific in its action as is the diphtheria antitoxin is in that disease.

Recently we have had a few cases of pneumonia in both adults and children which we have treated with pneumonia phylacogen, manufactured by one of the largest bacteriological houses in this country. They do not claim that their product is an absolute specific, but the late results of its use have been so gratifying that it is worth the trial in view of the fact that we lack a rational and curative therapy in pneumonia. Not long since the manufacturers sent me a complimentary package through the courtesy of their trade representative in this territory with the request that it be given a trial in the first case of pneumonia that we had, so I wish to present herewith the clinical report of the cases treated with their product. I wish to say that the results were little short of brilliant, and since these cases had been treated along the lines usually adopted without improvement or cure the decided specific action of the phylacogen is the more apparent and positive.

Case 1. This case was that of a three-year-old boy, who developed a case of broncho-pneumonia on Christmas day last. When seen that afternoon I was quite sure that he had a pneumonia, but reserved a positive opinion until the next day. The child had had a very

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severe cold, and evidently the pneumonia was the result of an extension into the lungs. The little patient had a temperature of 102° F., pulse 130, and respiration of 48; there was cough, flushed cheeks, and the physical examination of the chest showed a slightly limited respiratory excursion, hyperresonance over both lungs, and throughout the greater area of both lungs large and small moist rales. Several times during the boy's illness I found the lungs practically free of any rales or other physical signs, but that pulse and temperature ratio was maintained. The fever curve showed the usual morning remissions that we are accustomed to see in pneumonia, once or twice touched normal, though the oscillations were usually 100 1-2° F. morning to 101 1-2° to 102 2-5° evening and night. The highest temperature noted was 104° one or two afternoons. There was no tendency for the temperature to run high or show wide excursions. Throughout the pneumonia the pulse range was between 112 to 140 and the respirations varied between thirty-two and fifty, both being accelerated or retarded by the temperature curve. This little patient had at times decided tympanites, quite usual with pneumonia in children, and each time it occurred the heart and respiration was interfered with proportionate to its extent.

Up to the tenth day the treatment consisted in abundance of fresh air, the child's bed being by an open window and the room freely ventilated and kept cool; the taking of water was encouraged and given often; counter irritation over both lungs with mustard jacket every six hours until the surfaces were a sunburn red; the patient was fed every two hours. A mixture of euquinine, salol and sodium salicylate was given every three hours, and the bowels kept active with castor oil or cascara. Temperature above 102° was controlled by tepid baths, cold enema, or ice cap to the head. Under this treatment there was no change in the child's condition on the tenth day, and the parents were beginning to get anxious and ask questions as to why the child did not get well or the fever quit. They were plainly worried and I saw it. The boy was not dangerously ill did I think, and the advice that pneumonia in children was quite different to the adult type and that the child might be sick three to six weeks but made parental hearts the more critical. About this time the phylacogen arrived, and I decided to give it an immediate trial. The morning of the tenth day I gave ½ c. c. dose subcutaneously and repeated the dose in twelve hours, and on the eleventh day increased the dose to 1 c. c. morning and

night. The morning temperature was 99 2-5° and the afternoon was 100 2-5° the twelfth day, and the patient was given 1½ c. c. and repeated at the twelve hour interval. The next day the temperature did not exceed 99 2-5°, and the convalescence was rapid and uninterrupted. He was given 2 c. c. on this day, and is now perfectly well.

Case 2. Lobular pneumonia; adult female, mother of one child, and a negative family history. This patient was taken ill about 7 p. m. the 9th of January with a chill or rigor, pain in the left side, though not severe or stab like, increased respiration, cough, temperature 102 3-5°, and marked restlessness. I found her on the afternoon of the second with a temperature of 103°, pulse 116, and respiration twenty-eight. Physical examination of her left chest showed slightly limited motion, which I ascribed more to pain on breathing, tactile and vocal fremitus were practically normal, and only here and there was the percussion note changed from the normal. Auscultation showed fine rales over limited areas in the left lung, and over these involved portions of the lung was heard broncho-vesicular breathing. The patient was expectorating a blood-stained sputum; not, however, so characteristic of a lobar pneumonia, less free and not so red or prune juice in color.

The patient was taking quinin, viskolein and salol in capsules every two hours, was given a preliminary calomel purge, and the bowels kept moving with oil and salts. Counter irritation was practiced over her chest, and abundance of fresh air and nourishment encouraged. In view of the happy result experienced with the case just reported, I administered 1½ c. c. of pneumonia phylacogen at my first visit. That night I was called and informed that the patient's temperature was 104°. Being in the country I did not see her until the twenty-four hour interval was up, and found her fever 102 3-5°, pulse 120, and breathing about 24. At this visit I gave 3 c. c. of phylacogen. The next morning, the fourth day of her illness, her temperature was 99°, but reached the usual 102 2-5° by five o'clock. Did not see her this day. A temperature of 101 1-5° and a pulse rate of 112 ushered in the fifth day, while the other symptoms were unchanged. 4 c. c. pneumonia phylacogen given. Her husband phoned me the next morning, the sixth day of her illness, that her temperature was normal, and it did not rise again above 99 1-5 . This return to normal was unattended by the rapid fall of fever or critical sweat that is common with the usual pneumonia crisis.

PROCEEDINGS OF THE AMERICAN SOCIETY OF TROPICAL MEDICINE.

THE OCCURRENCE IN THE UNITED STATES OF CERTAIN NEMATODES OF RUMINANTS TRANSMISSBLE TO MAN.*

By B. H. RANSOM, Bureau of Animal Industry, U. S. Department of Agriculture.

The primary purpose of this note is to call attention to the occurrence in this country of three of the four species of *Trichostrongylus* that have been recorded as parasites of man. These nematodes have already been reported for the United States (Ransom, 1911) so that the present note may appear rather unnecessary. It seems, however, to be justified by the circumstance that the original report appeared in a publication not likely to be seen by physicians, and as that report seems never to have been reviewed in detail in any of the medical periodicals nor to have been taken into consideration in any of the medical manuals which have come to my notice, it is quite probable that very few physicians, even of those most interested in parasitology, know of the occurrence of the parasites in question in the United States. As a matter of fact, though they are common enough in ruminants, none of the three has yet been found in man in this country. The apparent reason for this is not because they do not occur here in the human host, but because they have not been properly looked for, and I have little doubt if the fact of their common occurrence in this country were generally known that some at least of the various species of *Trichostrongylus* would soon be added to the list of parasites recorded for man in the United States. I have therefore taken the opportunity of this appearance before a society particularly interested in medical zoology to point out, even at the risk of incurring the guilt of needless repetition, that the trichostrongyles are not mere exotic forms occurring in remotely distant regions, but are parasites which have a certain direct and immediate interest to American physicians.

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Trichostrongylus colubriformis (Giles, 1892) usually referred to in the text books as *Strongylus subtilis* or *Trichostrongylus instabilis* is very common in sheep and goats in the eastern United States, and has been encountered in large numbers in animals which died following symptoms of parasitic disease. It has also been found in camels, antelope, and deer which died at the National Zoological Park, Washington, D. C. Loos in 1905 showed that *Strongylus subtilis* originally described in 1895 as a parasite of man occurred in sheep, apes, gazelles and camels in North Africa as well as in human beings and was identical with Railliet's *Strongylus instabilis* which was originally reported in 1893 from the sheep, goat and roe deer in Europe. Clayton Lane (1913) by a re-examination of the original specimens of Gile's species which were collected from sheep in India, has apparently definitely established the identity of *colubriformis* and *instabilis*. The species, accordingly, in conformity with nomenclatural rules, takes the name *colubriformis* given to it by Giles in 1892, the name *instabilis* as well as *subtilis*, because of their later dates, falling into synonymy.

The nematodes which Ogata discovered in a Japanese woman in 1889, afterwards identified by Ijima (1895) as *Strongylus subtilis*, also those reported by Kitamura and Oishi (1913) from South Japan and Korea, are not *subtilis*, according to Jimbo (1914), but another species, namely *Trichostrongylus orientalis* Jimbo, 1914. This form is known only as a parasite of man and has been reported only from Japan and Korea.

Trichostrongylus vitrinus Looss, 1905, which has been found in Egypt as an occasional parasite of man, as well as of sheep and camels, occurs in sheep and goats in the eastern United States. It is less common than *T. colubriformis* and relatively few individuals have been found in any case of infestation in which it has been observed.

Trichostrongylus probolurus (Railliet, 1896), found by Looss occasionally in man and in the sheep, gazelle and camel in Egypt, and originally reported by Railliet in the camel in Europe, has been found but once in the United States, namely, in a Bactrian camel which died at the National Zoological Park, Washington, D. C.

Of the above-named species of *Trichostrongylus*, *T. colubri-*

formis is apparently by far the most common in the United States, and perhaps is the most likely to be found as a parasite of man. There appear to be no statistics as to the frequency of *Trichostrongylus colubriformis, vitrinus,* and *probolurus* in man, but Jimbo found *T. orientalis* in 27 out of 57 cadavers examined for its presence, and he notes that in addition he had under treatment 5 patients who were infested with this parasite. Generally the number of individual worms found was less than 10, and only exceptionally did the number exceed 50.

Trichostrongylus orientalis therefore seems to be a rather common parasite in Japan, which leads one to suspect that the trichostrongyles are not such rare parasites of man as is generally supposed, and that investigators in other parts of the world who will make the same careful examinations as Jimbo made are likely to arrive at very similar results.

The absence of records of the occurrence of one or more of the species of *Trichostrongylus* in man in the United States even though these parasites should be comparatively common in that host is not surprising. The worms are small and slender, less than 7 mm. in length, hence are readily overlooked either in the feces or in the intestine on post-mortem examination. The small numbers which are usually present in human cases is also a circumstance which renders their detection difficult. The similarity of their eggs to those of hookworms is liable to result in their being mistaken for the latter on casual observation, but their larger size (length in the species thus far recorded in man, 73 to 91 microns) as well as the fact that the eggs are in somewhat later stages of segmentation when passed in the feces, are rather conspicuous features of *Trichostrongylus* which can hardly fail to attract the attention of any observer who has them in mind.

Because of the evident adaptability of members of the genus *Trichostrongylus* to existence in the human intestine and because of the possibility that some of those not yet recorded as such may be found occurring as parasites of man, it will not perhaps be inappropriate if I refer here to the species present in the United States that are not known to be transmissible to human beings. *Trichostrongylus extenuatus* (Railliet, 1898) is very common in cattle and has been found also in sheep, goats

and several species of deer. Another species, *T. capricola* Ransom, 1907, has been frequently found in goats and sheep and once in the prong-horned antelope. Seven species not yet known to occur in ruminants have been seen in this country. *Trichostronglus axei* (Cobbold, 1879) or a nearly related species has been found in the horse; *T. retortaeformis* (Zeder, 1800) and *T. calcaratus* Ransom, 1911, have been reported from rabbits; *T. delicatus* Hall, 1916, occurs in one of the squirrels; *T. fiberius,* Barker and Noyes, 1915, has been described as a parasite of the musk rat; *T. tenuis* (Eberth, 1861) has been collected from the goose; and *T. pergracilis* (Cobbold, 1873) has been found in quail and grouse.

From the foregoing it is seen that altogether twelve species of *Trichostrongylus* have been found in the United States, including three of the four species known to occur in man in other parts of the world. As some of these species are very common in this country, and as careful examinations of human beings in other countries (Egypt and Japan) have demonstrated that worms of the genus *Trichostrongylus* occur more or less frequently in the human host (nearly 50 per cent of individuals examined in one series in Japan showing infestation) it is probable that more careful examinations than those customarily made will show that some of the species in question occur likewise as parasites of man in the United States.

In order to complete the list of nematodes which are characteristically parasitic in ruminants but may also occur in man, another species in addition to those already mentioned should be noted. This species, *Hæmonchus contortus* (Rudolphi, 1803), as its name indicates, belongs in another genus. It is known commonly as the stomach worm of ruminants, sometimes as the twisted stomach worm. Of frequent occurrence in this country as a parasite of sheep, cattle and other ruminants, it is the cause of a great deal of damage to the live stock industry. It has been recorded once as a parasite of man, having been found in Brazil by Magalhæs (1908) in a case of anemia which rapidly improved after treatment with thymol. The specimens upon which Magalhæs based his opinion as to the identity of the parasites were recovered from the feces. *Hæmonchus contortus* is a form of considerable size, measuring 10 to 30 mm. in length. As the worms of this species are more slender than hookworms

and otherwise quite different in appearance even upon naked eye examination, they are not likely to be mistaken for the latter. The eggs resemble hookworm eggs, but like those of the trichostrongyles are considerably larger (length 75 to 95 microns), and when expelled from the intestine of the host (at least in the case of ruminants) are in somewhat later stages of segmentation than the hookworm eggs seen in fresh human feces.

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STUDIES ON TRICHOMONAS.*

By NATHAN BARLOW, M. D., Saint Louis, Mo.

There have been a number of recent papers, ascribing pathogenic effects of greater or less severity to *Trichomonas intestinalis*. This parasite was discovered in certain cases among the patients of Barnes Hospital, in the course of a study of the intestinal parasites prevalent in St. Louis. Owing to the rapid disappearance of the trichomonads shortly after passage from the body, the prevalence of the parasites was determined by the administration of salines to one hundred unselected cases and examination of the specimens while in a perfectly fresh condition. Twenty-five of these one hundred patients were found to harbor trichomonads in greater or smaller numbers. A few additional cases were discovered among patients who had been referred from the gastro-intestinal clinic, on account of symptoms which suggested the possibility of the presence of intestinal parasites.

It may be noted that twenty-two of these twenty-five patients had been reported as negative to intestinal parasites, after routine examination. This indicates the necessity of examining absolutely fresh specimens obtained after the administration of saline cathartics in order to ascertain the presence of protozoal parasites. The routine examinations were never made later than three hours after the collection of the specimens.

After careful search, I, myself, failed to find parasites in a number of such specimens from patients whom I knew to be infected. As most complete and detailed records were available, a most excellent opportunity was afforded of determining what pathogenic effects, if any, could be ascribed to the trichomonads. The symptoms most commonly attributed to these parasites are alternating diarrhea and constipation. These symptoms were present in fourteen of the cases which were studied. In six of these cases there were other conditions present, such as tuberculosis, dilatation of the colon, or surgical conditions of the abdomen which were fully adequate to explain the symptom. Five of these cases, of which two were from the Barnes Hospital service and the other three were referred cases, were infected with typical *Endameba histolytica*. The other three cases were in-

*Read at the thirteenth annual meeting of the American Society of Tropical Medicine, held in Washington, May 9, 10, 11, 1916.

fected with endameba, which, while not presenting all the characters of histolytica, were certainly not at all similar to *Endameba coli.* One of the cases in which it was very difficult to find trichomonads on ordinary occasions, but which, in the mild diarrhea following indiscretions of diet, presented them in considerable numbers, apparently afforded an instance of a relationship between the trichomonas and the diarrhea, but it was later found that a few doses of any cathartic would bring about the same increase in the number of trichomonads present.

An experiment was made with certain of the cases in which only small numbers had been found. If specimens following saline or other cathartics were requested on successive days, the number of trichomonads steadily increased, suggesting that their increase in numbers at the time of intestinal disturbance is a result and not a cause, and depends upon the more favorable conditions for growth produced by fluid stools.

Careful study was made of the hemoglobin percentage and of the red and white cell count. These were found to depend entirely upon the other conditions present. If there were no other diseases which would account for anemia, leucopenia, or leucocytosis, these counts were found as nearly normal in the cases showing infections with Trichomonas, as in the cases which were free from parasites. Four of the cases of Trichomonas infections presented an eosinophilia of from 3% to 6.8%. These cases all had a concomitant infection with *Endameba histolytica,* or with some endameba which appeared to approach in character as closely to the pathogenic as to the unpathogenic forms. No cases infected with Trichomonas alone had an eosinophile count greater than 2.5% and the only case which was literally swarming with trichomonads did not show a single eosinophile in several examinations of blood stains.

Nervous manifestations such as neuritis, neurasthenia, irritability, etc., were manifested only in those cases in which they could either be accounted for by some pathological condition present or else in which the history clearly showed evidence of a congenital neuropathic tendency. None of these cases showed loss of appetite, weakness or general debility, unless there were other conditions which fully accounted for these symptoms.

A careful study was made as to the relationship of the pres-

ence of these parasites to degenerations of the heart or to pathological conditions in the liver or other organs. In no instance was any such condition found, unless there were one or more serious systemic disorders fully sufficient to account for the condition.

No difficulty was experienced in growing the organisms in the acidified bouillon recommended by Lynch. A number of experiments were made with rectal injections in rabbits of considerable quantities of such cultures and also of perfectly fresh material containing very large numbers of trichomonads. In some instances trichomonads could be recovered from the rabbit for a few days following, but in not a single instance did the infection last for more than five days, nor was there ever any diarrhea or other sign of disturbance produced in the rabbit.

With certain of the patients an effort was made to destroy the infection. Flowers of sulphur administered continuously for a number of days was found absolutely without effect. One luetic patient had recently received a prolonged course of mercury by oral administration and was given two doses of salvarsan of 6-10 gram each, without producing any effect whatever on the trichomonads.

Four cases with a concomitant endamebiasis were treated with moderately long courses of emetin, one grain daily, in one instance accompanied by ipecac administered orally, without any effect whatever on the trichomonads other than the diminution in number which always accompanies an amelioration of a catarrhal condition of the intestines. Methylene blue was tried upon three cases in doses of one grain three times daily. In each case it was continued until the patient experienced slight vesical irritation, which took place in from four to seven days. Living parasites are not to be observed in feces which are impregnated with methylene blue but as soon as the dye had been removed from the body, they rapidly increased and in a short time were present in as large numbers as ever. Thymol was tried in small doses, six grains three times daily, and was found the most efficient of all drugs against the trichomonas of St. Louis. One patient remained free from Trichomonas for four weeks after which they reappeared in the stools. When the parasites have been reduced in number or caused to completely

disappear by either methylene blue or thymol, there was no improvement to be noticed in the subjective or objective condition of the patients, which seems to afford a further proof that these organisms are ordinarily non-pathogenic. It is, of course, not impossible that there may be different strains or even different species of Trichomonas and that some of these are at times more or less pathogenic. Or after the very great increase in their numbers which takes place whenever an infected individual has any intestinal disturbance whatever, even so slight a one as that induced by several doses of cathartics, it may be possible that such enormous numbers could contribute to the irritation already produced by other pathogenic influences.

Although very careful and prolonged observations were made, the greater part of the time for several weeks having been devoted to the study of these organisms, but little was accomplished other than to confirm the morphology as it has been described by various writers. Only a brief description will therefore be given, sufficient to indicate the description of the trichomonads of this region with reference to the characters which have been found to vary in different localities.

Trichomonas intestinalis in St. Louis was found to be usually from 10 to 18 microns in length. Forms of 22 to 25 microns are frequently encountered and one individual of 32 microns in length was found. When uninjured by changes of temperature, the Trichomonas is spindle-shaped or lanceolate, both extremities being pointed, the posterior extremity usually very slightly prolonged, forming an appendage or tail which may, however, equal or exceed the body in length and occasionally shows a small spherical expansion at the extremity. By ordinary illumination it appears composed of two portions; a homogeneous or slightly granular endoplasm, containing a greater or smaller number of ingested food particles mostly bacteria and a perfectly transparent and pellucid ectoplasm which is in constant motion. The character of this motion can only be distinctly made out by dark field illumination and it seems to consist of two distinct movements, one of which is an undulatory motion, progressing very rapidly from the anterior to the posterior extremity. The other movement consists in the projection of pseudopodia which when projected, move from the anterior to

the posterior extremity, gradually becoming less prominent as they approach the tail.

From the anterior extremity there project four flagella formed by the extrusion of the ectoplasm and which are in constant very rapid whip-like motion, when the trichomonas is swimming free. When fixed, this motion becomes more rotatory in character and creates a constant stream directed against the anterior end. At certain times there is to be seen a depression or cleft near the base of the flagella, usually very transient but sometimes persisting as long as the organism is observed, which undoubtedly serves as a temporary cytostome. The pseudopodia are composed of ectoplasm only. They may be rounded or filiform in character but are usually shaped more or less like a shark's tooth with the concavity directed backward. They may be projected from any portion of the ectoplasm but are usually put forth only along the myonime which passes from the origin of the flagella to the posterior extremity. These follow each other in such rapid succession that the portion of the ectoplasm containing the myoneme is elevated from the body of the parasite to a variable height and length, creating an undulating membrane which, however, is in no way a permanent structure but varies in length, height and thickness and may entirely disappear. It is usually plainly made out under dark field illumination for about three-quarters of the distance from the anterior to the posterior extremity.

Prolonged and careful observation has convinced me that the trichomonas is normally fixed by the tail to an epithelial cell or to some solid body, that the tail takes no part in locomotion and that the flagella and undulating membrane are only secondarily organs of locomotion and that their primary purpose is to create currents in the surrounding medium, which bring food particles within their reach and to grasp and hold these particles until they can be taken up by temporary stomata.

The endoplasm has a somewhat limited but frequently very active motion. It consists of the change of form sometimes resembling that of the ameba and sometimes a peculiar doubling and undoubling, resulting in the reversal of the direction of the organism. The endoplasm never puts out pseudopodia and I have never observed it to enter into the formation of a pseu-

dopod of the ectoplasm. On exposure to air, light, or to a temperature a few degrees below 30° C., motion is very rapidly lost and the trichomonads undergo one of three changes, according to the rapidity of action of the adverse influence.

Most commonly the flagella, the tail and the undulating membrane disappear, irregular pseudopodia are projected from various parts of the ectoplasm, although for a small distance along the myoneme a suggestion of an undulating membrane might persist. The organism becomes spherical in form, swells up and becomes pale and suddenly disappears by plasmolysis. Owing to this form of change, unless warm, fresh specimens are examined, trichomonads will not be found unless originally present in enormous numbers.

The second form of change consists in a withdrawal of the flagella and undulating membrane and persistence of the tail, which retains a certain amount of to and fro motion, and a loss of elasticity of the ectoplasm which permits it to sag backward, giving the appearance of a small oval body, the endoplasm. contained in a leaf-shaped sac of ectoplasm. Occasionally pseudopodia may be still projected from the ectoplasm, but after a certain length of time, the organism swells up and undergoes plasmolysis as in the first form of change.

In the third form of change the organism withdraws its appendages, becomes spherical in form, homogeneous in appearance, acquires a somewhat thickened outer membrane and is apparently a resistant form or dauer-cyst. These dauer-cysts may be readily recognized by any one familiar with trichomonads and while I have never failed to find the parasite in cases in which I had seen the dauer-cyst, in old specimens the character of the cysts is not sufficiently distinct to base a diagnosis upon their presence alone.

Although most careful search was made for true amebic forms and for reproduction cysts, they were never observed either in specimens or in cultures. Efforts were made to obtain variations in the organism by varying the composition and consistency of the culture medium. No change could be produced other than alterations in the rapidity of growth. There were several patients in whom it was at first thought that the trichomonads showed certain morphological differences from those observed

in the majority and that these differences persisted over a number of examinations. It was always possible, however, to find a few typical trichomonads and on making cultures from these patients, all of the trichomonads were typical in every respect.

The method of division is longitudinal, commencing at the flagella, two flagella going with each half of the organism, and the division progressing backward to the tail. My observations seemed to indicate that under normal conditions this process is extremely rapid, probably not consuming over three or five minutes in its entirety. The complete division is never witnessed under a microscope, as the change from the body to the host or from the culture medium in a dark incubator to the stage of the microscope, is sufficient to prevent the beginning of division. Many of those in whom it has already commenced, will complete it before they can be observed. Very occasionally, either the first or the last portion may be seen under the microscope. When seen, it is very rapid, as long as it advances at all. Most of the dividing forms seen under the microscope are already so far injured that no further change takes place, no matter how long they are observed. It is probable that the great rapidity of division accounts for the scarcity of dividing forms encountered and for the almost complete impossibility of finding the nucleus in mitosis.

As with the amebæ, the various forms of Romanowsky stain were found too variable and uncertain to be of any real value in determining morphology. The only satisfactory stains were the modifications of the iron hematoxylin method. The greatest difficulty in staining is to obtain a satisfactory fixation. If freshly passed mucus containing trichomonads can be quickly smeared and immediately plunged into a fixing bath, Schaudin's fluid being very satisfactory, the trichomonads can frequently be fixed with no other change than a somewhat more spherical shape, the flagella and undulating membrane remaining apparently unaltered. The protoplasm, in addition to the food vacuoles, shows a vacuolated appearance which is undoubtedly due to the staining reagents.

The nucleus, which is usually completely invisible in fresh specimens, is seen at the anterior end. It consists of a definite nuclear membrane on the inner surface of which is a fairly uni-

form deposit of chromatic material, and a flask-shaped karyosome, the pointed extremity of which touches the anterior pole of the nuclear membrane. The chromatin of the nucleus is so dense that it is difficult to make out the finer details of structure but when over decolorized, it may be seen that the apparently flask-shaped karyosome is really a round karyosome from which numerous chromatic threads converge to the anterior pole of the nucleus. There also seems to be a chromatic network between the karyosome and the nuclear membrane. From the point to which these chromatic threads converge, a delicate rhizoplast runs to the anterior extremity of the trichomonad, where it seems to be expanded into a single granule of chromatic material from which granule arise the four flagella and a delicate myoneme which runs backward to the posterior extremity and is raised to the outer edge of the undulating membrane, when this structure is present.

In the examination of several hundred stained specimens, the four basal granules described by Lynch could never be observed and the four flagella seemed to always arise from a single granule and from the same point at the anterior extremity. The appearance described by some writers of a pseudopod projected between two pairs of flagella, I believe to be due to the position of the parasite in which the true origin of the flagella was not visible but after having passed for a short distance on the undersurface of the parasite, and separated into two pairs, a pseudopod arising in front of them appeared to be between them. It will be noted that the nuclear structure and mode of origin of the flagella, are precisely similar to those described by Wenyon for the cercomonas which was cultured by him. An axostyle or other supporting structure was never observed nor was there in a single individual, any appearance which by any stretch of the imagination could even suggest the existence of internal structures such as those figured by various authors for the trichomonads of animals.

Trichomonas vaginalis has a precisely similar structure but shows differences in its greater size, in the shorter length of the flagella as compared with the body, and in the shorter comparative length of the undulating membrane which is ordinarily invisible except anteriorly, in its more prompt loss of active mo-

tion, under adverse conditions, in never possessing the pointed anterior extremity and resulting lanceolate or spindle-shaped form of T, intestinalis, in the smaller number of ingested food granules, in greater difficulty in cultivation and in greater readiness of cyst production. In one case of infection with *T. vaginalis* in which it was possible to make a careful examination for *Trichomonas intestinalis*, it was not found, although *Trichomonas vaginalis* was found on two separate examinations. In another case in which for some reason the vitality of the Trichomonas seemed decreased at the second examination, there was a large number of round or oval cyst-like bodies measuring from 20 to 30 microns, containing usually a single small nucleus or occasionally from 2 to 8 nuclei, grouped at the center of the cyst. In a single instance some of these nuclei presented an appearance when stained, which seemed to indicate karyokinetic division. These bodies appeared very much like reproduction cysts. In cultures, *Trichomonas vaginalis* dies out very readily but as long as the culture remains alive, the characteristics of the organism are maintained and it does not approach *Trichomonas intestinalis* in its morphology.

I am therefore inclined to believe that the two forms are valid species.

A series of one hundred cases from the gynecological clinic was examined for the presence of *Trichomonas vaginalis*. Five cases were found infected. The parasite apparently can thrive only in cases having some pathological condition which produces a free discharge, such as the postpartum state, chronic gonorrheal endocervicitis, subinvolution with chronic endometritis, etc. In all of these cases the character of the secretions and the intensity of the symptoms seemed to depend entirely upon the bacteriological infection and surgical condition, and to be in no way altered by the presence of the trichomonads.

I wish to acknowledge my indebtedness to Dr. George Dock for permission to report these results, and to the various members of the Staff of Barnes Hospital and Washington University for their co-operation in the work.

CLINICAL REPORT OF A CASE OF DIARRHEA APPARENTLY DUE TO FLAGELLATE PARASITES.*

By JOHN B. ELLIOTT, Jr., M. D., New Orleans.

Miss A., aged 25; of Southwest Louisiana, was seen by me for the first time on May 4, 1915. She gave the following history:

> Had always lived in Southwest Louisiana. Mother and father both living and in good health. Two brothers and two sisters living, all healthy. Had chicken pox and whooping cough before the age of 12. Commenced menstruation at the age of 14 and was very irregular for the first two years.
>
> In 1908 had acute attack of appendicitis. The appendix was removed. In 1909 was curretted because of pain and irregularity of periods. At this operation, it was discovered that the uterus was of the infantile type.
>
> In March, 1910, she was taken rather suddenly with diarrhea, almost dysenteric in character, averaging from nine to fifteen stools a day; these stools were bloody and contained mucus. There was constant headache but no fever and no indigestion.
>
> When this first developed, she weighed 116 pounds, but went down rapidly to 80 pounds. The dysenteric character of the stools disappeared in about two months, but she continued to have from eight to ten actions a day of a watery character, but with no mucus, no blood, nor tenesmus. For this condition, numerous astringents were tried during the next year, but none had any effect. In November, 1911, her tonsils were removed in the vain hope that suppuration there might be the cause of the trouble. During 1912, she was treated twice for amebic dysentery by two local physicians, taking emetin and ipecac in every conceivable form and quantity, but with no effect.
>
> In the summer of 1913 she went to the coast of Maine for three months, but this change of climate had no effect on the diarrhea.
>
> In 1914, things continued as before; never less than six movements a day; generally eight or nine; most of them occurring between four and ten a. m.

I saw this patient for the first time, as above stated, on May 4, 1915. She looked a typical picture of one suffering from pernicious anemia. An examination showed her heart and lungs to be normal; liver little enlarged; spleen not enlarged. Her

*Read at the thirteenth annual meeting of the American Society of Tropical Medicine, held in Washington, May 9, 10, 11, 1916.

leucocytes were 17,300; red cells 4,200,000. Differential count showed lymphocytes 53%; endothelial leucocytes 16%; neutrophiles 31%. Anisocytosis. A few neucleated reds. Color index point five-three.

An examination of the feces showed nothing abnormal, but after a dose of salts the stools were one mass of *Cercomonas hominis*. Dr. C. C. Bass could find no amebæ. A thorough examination showed no tubercle bacilli in the feces.

A stomach examination showed a slight achylia. A proctoscopic examination made by a most competent man just prior to my seeing her showed no ulcers anywhere in the large bowel.

The Wassermann reaction was negative.

The X-ray examination showed nothing abnormal throughout the intestinal tract except for the first time I was enabled to see fermentation in the small bowel. This was very striking.

While unable to make a diagnosis, and doubting that the parasites could be the cause of the diarrhea, I placed the patient on thymol, sixty grains a day for one day in each week, in other words, the usual treatment for hookworm. I also gave her dilute hydrochloric acid, 40 minims after each meal.

A letter on June 2 stated she had lost three pounds but color better. Number of stools the same.

When seen again on June 5 the blood examination showed exactly as before. The stools of the first two days looked much like sprue. Another X-ray of the large bowel at this time seemed to show atony.

During July, while still on the thymol, patient gained 8½ pounds, and the number of stools was reduced to four in twenty-four hours; hardly any fever during this month, the diet being soft food entirely, containing no cellulose. Thymol was taken every two weeks during July, August and September, but all she had gained in July was lost in the next two months.

I might also add that she was taking bismuth by enema for three weeks in July, as well as resting daily from 9 to 11 a. m. and again from 2 to 4 p. m.

In August she grew rapidly worse; had temperature 100° daily, with bad headaches. Bowels the same. Was given emetin for the next month, off and on, with no improvement. Was then placed on chenopodium in seven drop doses twice a

day, and increased up to 16 drops a day during the month of October.

During all these three months, July, August and September, she was on a most careful, soft diet.

On November 24, 1915, patient returned to New Orleans for further observation. Her hemaglobin was 70% against 45% in May. Red cells 5,100,000; white cells differential count at that time showed lymphocytes 53%; endothelial leucocytes 18%; neutrophiles 28%. The feces contained comparatively few cercomonas, but she had taken no purgative prior to my seeing her.

A rectal examination disclosed a band of tissue stretching across the bowel about two inches from the nus, which easily ruptured and bled only slightly. Further examination of the rectum showed only a very small ulcer just above the site of this band, which was entirely healed in two applications of silver nitrate.

Examination of the feces on March 27, 1916, still showed the presence of numerous parasites.

On April 3, 1916, patient again returned for observation. Says she gained four pounds in January; that she had taken during that month eight doses of emetin of 2 grains each by needle; that she had been using nitrate of silver or quinin daily by enema, with absolutely no change in the number of stools; that she also took an infusion of powdered pecan-nut shells, an old French remedy in her part of the country.

On Monday, March 27, 1916, had a very small hemorrhage from the bowel, preceded by a pain in the back, and much weakness. Her weight at this time is 86½ pounds.

An examination of the stools by Dr. C. C. Bass and Dr. W. H. Harris showed the same excess of parasites; no amoebæ present after exhaustive search; no free fat in the stools; no tubercle bacilli.

A red blood count showed 4,270,000 cells; white count 3,980; hemaglobin 55%; lymphocytes 60%; endothelial leucocytes 9%; neutrophiles 28%. Negative Wassermann.

Stomach examination showed the same hypochloridia. Free H. Cl. 9; combined acids 13; total acidity 22.

All physical examination negative as before. Still having her regular eight movements a day.

From April 3 to May 6 has again been taking dilute hydrochloric acid, 40 minims after each meal, to which has been added pancreatin, 15 grains three times a day and a kaolin 8 drams. Her rest periods and diet as before. Letter on May 8 reports conditions unchanged.

This case is still undiagnosed, but I must believe that the parasites are the factors in its etiology.

THE BILATERAL DISTRIBUTION OF THE LESIONS IN LEPROSY IN RELATION TO THE BACTEREMIC NATURE OF THE DISEASE.[1]

By D. RIVAS, Ph. D., M. D.,

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(From the Laboratory of Comparative Pathology and Tropical Medicine, University of Pennsylvania, Philadelphia.)

(Through misunderstanding the accompanying illustrations were omitted from the September JOURNAL.)

The illustrations, together with the accompanying legends, should face page 218.)

DESCRIPTION OF PLATES.

Fig. 1. Maculo—anæsthetic Leprosy showing bilateral lesions all over the body.

Fig. 2. Leper showing bilateral amputation of digits and lesions on the face and extremities.

Fig. 3. Tubercular leper. Note symmetry of lesions, especially in ears.

Fig. 4. Leper showing extensive amputation of digits in both hands.

Fig. 5. Leper showing symmetrical lesions on the face.

Fig. 6. Group of lepers showing bilateral amputation of digits.

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NEWS AND COMMENT.

BRITISH MEDICAL ASSOCIATION MEETING.—The eighty-fourth annual meeting of the British Medical Association was held in London during July. Because of the war the scientific and social side was entirely dropped and only political matters were discussed.

THE MISSISSIPPI VALLEY MEDICAL ASSOCIATION will hold its forty-second annual session at the Claypool Hotel, Indianapolis, October 10, 11 and 12, 1916. A very interesting program has been prepared, scientifically and socially, and a very successful meeting is anticipated.

TUBERCULOSIS CONFERENCES.—The Mississippi Valley Conference on tuberculosis will be held at the Seelbach Hotel, Louisville, Ky., October 4-6, under the presidency of Walter D. Thurber, Chicago.

The third Southern Conference on Tuberculosis will be held at Jackson, Miss., October 30 and 31. The states comprised in this conference are North Carolina, South Carolina, Tennessee, Georgia, Florida, Alabama, Mississippi and Louisiana.

The object of these conferences is to strengthen and extend the work of the national association on tuberculosis, and to bring about closer relations between anti-tuberculosis agencies and other health societies, providing for the interchange of ideals and experiences.

AMERICAN PROCTOLOGIC SOCIETY ELECTS OFFICERS.—At the last meeting of the American Proctologic Society, the following officers were elected: Dr. Alfred J. Zoble, San Francisco, Cal., president; Dr. Granville S. Hanes, Louisville, Ky., vice-president; Dr. Collier F. Martin, Philadelphia, Pa., secretary-treasurer. Executive Council: Dr. T. Chittenden Hill, Boston; Dr. Alfred J. Zoble, San Francisco; Dr. William M. Beach, Pittsburgh, Pa., and Dr. Collier F. Martin, Philadelphia.

THE CARTWRIGHT LECTURES.—Dr. Richard M. Pearce, professor of research medicine, University of Pennsylvania, will deliver the Cartwright Lectures for 1916 of the Association of the Alumni of the College of Physicians and Surgeons, Columbia University, on October 24 and 25. His subject will be "The

Spleen in Its Relation to Blood Destruction and Regeneration."

THE ALVARENGA PRIZE AWARDED.—The Alvarenga prize this year was awarded to G. Riedel, chief of the biologic chemistry service at the Hospicio Nacional and instructor at the University of Rio, Brazil. His work was on protective ferments and described extensive personal research.

NEEDLESS PETS.—The *Texas Medical Journal* for August comments on the fact that people are always making war on rats and mice but that dogs and cats are just as much disease carriers and germ spreaders as the former pests. Dogs and cats are freely admitted into our homes and are fondled and caressed by the women and children of families, often when they are loaded with disease germs. They are extremely filthy and are expensive to feed and dangerous to have around. It would be well if there was started an educational campaign in the country to exterminate these useless household pests.

WOMEN'S DISPENSARY REPORT.—At the September meeting of the New Orleans Dispensary for Women and Children, the reports for August were heard showing the hospital to be in full running order again, with all wards and clinics crowded. During the month 1,235 women and children were given treatment in the outdoor clinic; 505 treated in the surgical ward, with 45 operations and 2 deaths. The dispensary is growing rapidly in importance.

BIRTH CONTROL FAVORED.—At a meeting recently held in Des Moines, Iowa, representative physicians and heads of state institutions under the jurisdiction of the State Board of Control went on record in favor of birth control. It was the opinion of those present at the meeting that the practice would result in less crime, disease, social vice and other evils. Professor Clarence Van Epps, of the Iowa State University, declared that the wealthy classes already have knowledge of and practice birth control and that the same knowledge should be given to poorer classes by the state.

HEAVY DAMAGES FOR ILLICIT DRUG TRAFFIC.—A widow in the state of New York recently received $2,000 compensatory damages and $1,000 punitive damages against a firm of druggists who had sold heroin to her eighteen-year-old son. The judge in affirming the judgment said that during the time the

defendants were supplying the drug to the boy he became a vagabond, an idler, a drug fiend, and a criminal, undutiful to his mother, worthless to himself, dangerous to the community, and that the jury was right in concluding that all this was the result of the illicit traffic carried on by the defendants, and that they should be punished for their reckless disregard of the rights and welfare of the boy and his mother.

COMMUNICABLE DISEASES PREVALENT IN THE UNITED STATES.—A series of tables has recently been published by the United States Public Health Service showing the prevalence during the year 1915 in cities of the United States with a population of over 100,000 of the following diseases: diphtheria, gonorrhea, malaria, measles, epidemic cerebrospinal meningitis, pellagra, poliomyelitis, rabies in men, rabies in animals, scarlet fever, smallpox, syphilis, tuberculosis and typhoid fever. The health departments of the respective cities gave the data to compile these tables, and include the number of cases reported, indicatd case rates in a thousand of population, and indicated fatality rates in one hundred cases. The pamphlet, Reprint No. 347, Public Health Reports, may be obtained at five cents each, from the superintendent of documents, Government Printing Office, Washington, D. C.

BLOND BABIES AND INFANTILE PARALYSIS—Chicago investigation in infantile paralysis have proven by their records that more blue-eyed, golden-haired babies succumb to this disease than do the dark-eyed, dark-haired babies. They also show that in Norway and Sweden, where the disease is of common occurrence, the blue-eyed are the ones most easily stricken. Whether this be true elsewhere remains to be proven and the discovery may be an aid in finding a cure for the disease.

TWILIGHT SLEEP FAILS AT JOHNS HOPKINS.—The Johns Hopkins Hospital has abandoned its experiments in the use of "twilight sleep," with the conclusion that the method is too dangerous, and that the menace to the life of the new child is too grave to warrant its use, except under the most favorable circumstances. Twilight sleep has been abandoned in nearly every hospital where it has been tried.

RABBITS FOR PELLAGRA.—As pellagra is now said to depend largely on improper diet, Dr. C. W. Stiles, as a result of his

special study, advises a more extensive consumption of the flesh of rabbits and hares, as an addition to the meat supply. The animals breed and grow rapidly with little care or expense, and can be made available at any place without the necessity of cold storage.

COCAIN HABIT WITH SOLDIERS.—It has been discovered that among the large number of soldiers, invalided and otherwise, in England, cases of the cocain habit have attracted notice, with the result that a surreptitious traffic in the drug in saloons and other places has been detected. Drastic action has been taken by the government against this practise.

FRANCE DAY IN GREAT BRITAIN.—The French national fete day, July 14, was observed in Great Britain as France's Day for the benefit of the French Red Cross, with very satisfactory results.

U. S. NAVY SURGEON.—The next examination for appointment in the Medical Corps of the Navy will be held on or about October 23, 1916, at Washington, D. C., Boston, Mass., New York, N. Y., Philadelphia, Pa., Norfolk, Va., Charleston, S. C., Great Lakes (Chicago), Ill., Mare Island, Cal. and Puget Sound, Wash.

Applicants must be citizens of the United States and must submit satisfactory evidence of preliminary education and medical education.

The first stage of the examination is for appointment as assistant surgeon in the Medical Reserve Corps, and embraces the following subjects: (a) anatomy, (b) physiology, (c) materia medica and therapeutics, (d) general medicine, (e) general surgery, (f) obstetrics.

The successful candidate then attends the course of instruction at the Naval Medical School. During this course he receives a salary of $2,000 per annum, with allowances for quarters, heat and light, and at the end of the course, if he successfully passes an examination in the subjects taught in the school, he is commissioned an assistant surgeon in the Navy to fill a vacancy.

Full information with regard to the physical and professional examinations, with instructions how to submit formal applica-

tion, may be obtained by addressing the Surgeon General of the Navy, Navy Department, Washington, D. C.

MEDICAL DEPARTMENT IN TEXAS.—The surgeon general of the Army has installed some notable hospital facilities in Texas to meet the possible demands upon the medical corps in the way of the sick and injured of the troops serving along the border and in Mexico. Base hospitals of 200 to 500 beds have been established at Brownsville, Laredo, Eagle Pass, and Nogales. There is a base hospital at Columbus of 100 beds. Base hospitals of from 700 to 1,000 beds exist at Fort Sam Houston and El Paso. Camp hospitals of about 150 beds have been established at Mercedes, McAllen, Del Rio, Marfa, Deming, and Douglas. These institutions have been furnished with modern X-ray apparatus and surgical sterilizers for dressings, instruments and utensils. There is, of course, water sterilization, and at five of the places portable, wheeled, steam disinfectors have been installed suitable for disinfecting mattresses and cloth and of a capacity of 3 by 6 feet. The hospitals are equipped also with white enamel iron bunks and hair felt mattresses. In addition to these base and camp hospitals, there are the field hospitals with the organizations. Each division is entitled to four field hospitals and four ambulance hospitals, and many of the regiments have regimental hospitals. The reports received from medical officers in Texas and in Mexico indicate that the health of the troops is satisfactory, and that the best of care is being taken of those who have to be sent to the hospitals.—*Army and Navy Register.*

MEDICAL INTERN EXAMINATION.—The United States Civil Service Commission announces an open competitive examination for medical intern, for both men and women, on October 4, 1916, in St. Elizabeth's Hospital (formerly Government Hospital for the Insane), Washington, D. C., at a salary of $900 a year, with maintenance. The position is tenable for one year, during which time a postgraduate course in mental and neurological diagnostic methods is given, and examination is held, and promotions to the next grade junior assistant physician, are made. Applicants must show that they are graduates of a reputable medical college, or that they are senior students in such an institution and expect to graduate within six months from

the date of this examination. Applicants must be unmarried and must be 20 years old or over at the time of examination. For further information apply for Form 1312, stating title of the examination for which the form is desired, to the United States Civil Service Commission, Washington, D. C.

PERSONALS: Among the doctors of New Orleans who have returned from their vacations and resumed practice are: Drs. N. K. Edrington, A. S. Yenni, S. F. Braud, J. J. Ryan, C. L. Eshleman, W. D. Phillips, Hampden S. Lewis, J. T. Scott, W. M. Johnson, Isidore Cohn, Geo. J. Tusson.

Dr. Herman B. Gessner has returned to New Orleans after being stationed two months at Nogales, in service with the Army Medical Reserve Corps.

REMOVALS: Dr. T. M. Brister, from Hackley, to Bogalusa, La.

MARRIED: On August 15, 1916, Dr. Sidney Francis Braud, to Miss Agnes Marie Murphy, both of this city.

On September 6, 1916, Dr. James Birney Guthrie, to Dr. Haidee Weeks Latham, both of this city.

On September 14, 1916, Dr. Lucian H. Landry, of New Orleans, to Miss Lowell B. Sedgwick, of Columbia, Miss.

On August 28, 1916, Dr. Bridges Terry, of Alexandria, La., to Miss Luna Durio, of Glenmore, La.

DIED: On September 9, 1916, Dr. Rudolph H. von Ezdorf, surgeon in charge of the Marine Hospital in New Orleans, and prominently connected with the United States Public Health Service for more than eighteen years. His death occurred at Lincolnton, N. C., where he had gone to aid in the mosquito survey work of that state.

PUBLIC HEALTH NOTES.

GOVERNMENT HEALTH WORK IN ALASKA.—With the aid of special appropriations granted by Congress during the past two years Secretary Lane of the Department of the Interior, through the Bureau of Education, has been able to make considerable progrss in checking the ravages of disease among the natives of Alaska. The Government has recently opened a well-equipped hospital in Juneau for native patients and small hospitals are maintained at three other centers of native population. A number of physicians and nurses have been employed for service in

hospitals and in maintaining sanitary conditions in native villages; ad the teachers of the United States public schools in Alaska are supplied with medicines and medical books in order to enable them, in the absence of a physician, to treat minor ailments.

An investigation made several years ago showed that, without this work in disease prevention on the part of the Government, the native race in Alaska would soon die of tuberculosis and other diseases. The Department of the Interior and Congress have realized the urgent need for medical relief and it is believed that the steps now taken will help to keep our record clear in maintaining the native population of Alaska, and in relieving them from the suffering caused by disease and the lack of proper medical attention.

HEALTH NEWS: (United States Public Health Service).—It is a remarkable fact, confirmed by many observations, that many physicians who have devoted considerable labor to the study of a particular disease have themselves died of that disease. One of the most interesting examples is that of John Daniel Major, born August 16, 1634, in Breslau, a physician and naturalist of no mean ability. Bitten early by the wanderlust, he studied at Wittenburg, took courses at many of the schools in Germany, and finally went to Italy where he received the degree of doctor of medicine at Padua in 1660. Returning to his own country, he resided for a short time in Silesia, and in 1661 married at Wittenburg, Margaret Dorothy, a daughter of the celebrated Sennert. The following year, his young wife was stricken with plague and died after an illness of eight days. Distracted by his loss, Major wandered up and down Europe studying plague wherever he found it in the hope that he might discover a cure for the disease which had bereaved him. Spain, Germany, France and Russia were visited by him. He settled in 1665 in Kiel, where he was made professor of botany and the director of the botanical gardens. He made frequent voyages, however, always in quest of the remedy for plague. Finally in 1693, he was called to Stockholm to treat the queen of Charles the Eleventh, then ill with plague. But before he could render her

any service, he contracted the disease and died on the third of August.

U. S. P. H. S.—Congress has recently made an appropriation for 33 additional Assistant Surgeons in the United States Public Health Service. These officers are commissioned by the President, and confirmed by the Senate. The tenure of office is permanent, and successful candidates will immediately receive their commissions.

After four years' service, assistant surgeons are entitled to examination for promotion to the grade of passed assistant surgeon. Passed assistant surgeons after twelve years' service are entitled to examination for promotion to the grade of Surgeon.

Assistant surgeons receive $2,000, passed assistant surgeons $2,400, surgeons $3,000, Senior Surgeons $3,500, and assistant surgeon-generals $4,000 a year. When quarters are not provided, communtation at the rate of $30, $40 and $50 a month, according to the grade, is allowed.

All grades receive longevity pay, 10 per cent in addition to the regular salary for every five years up to 40 per cent after twenty years' service.

Examinations will be held every month or so in various cities, for the convenience of candidates taking the examination. Further information will be furnished by addressing the Surgeon-General, United States Public Health Service, Washington, D. C.

BOOK REVIEWS AND NOTICES

Anatomy of the Brain and Spinal Cord, With Special Reference to Mechanism and Function. For Students and Practitioners. By Harris E. Santee, A. M., M. D., Ph. D. Fifth Edition. 155 Illustrations, 46 in Colors. P. Blakiston's Son & C., Philadelphia.

In this work Santee presents a book that is at once a guide for the dissecting room and a systematic treatis on the structure of the nervous system. The numerous editions of the work attest its usefulness. The present edition copies after its predecessors by containing the substance of recent advances in anatomical knowledge, which has necessitated a thorough revision.

The study of the nervous is necessarily a difficult matter because of its complexity. Much of this complexity is overcome by the plan pursued in Santee's work, wherein the description proceeds from the gross structures to the constituent neurones in each successive region. Function is everywhere correlate with structure. The numerous illustrations form a valuable feature of the book and serve materially to lighten the student's burden in treading the hard path of a difficult part of anatomy.

Santee's work has already established for itself a high place in medical literature and the present edition secures it in its niche.

McShane.

Modern Medicine. Ssler and McCrae. Vol. V. Published by Lea and Febiger, Philadelphia and New York.

This volume is divided in two parts. Part I includes diseases of the nervous system, with an introduction, and Part II, diseases of the locomotor system.

It is the last volume of the second edition, thoroughly revised of that important work on the theory and practice of medicine.

E. M. D.

International Clinics. Vols. II, III and IV, Twenty-fifth Series, and Vol. I, Twenty-sixth Series. Published by J. B. Lippincott Company, Philadelphia and London.

These volumes bear favorable comparison with any of their predecessors. The contributions are most valuable as usual, furnishing always a source of practical information.

The collection of whole series, complete, would be appreciated by any lively physician.

E. M. D.

PUBLICATIONS RECEIVED

W. B. SAUNDERS COMPANY. Philadelphia and London.

Diagnosis and Treatment of Surgical Diseases of the Spinal Cord and Its Membranes, by Charles A. Elsberg, M. D., F. A. C. S.

The Medical Clinics of Chicago. July, 1916. Volume II, No. 1.

The Clinics of John B. Murphy, M. D. Mercy Hospital, Chicago. Edited by P. G. Skillern, Jr., M. D. August, 1916.

PAUL B. HOEBER. New York, 1916.

Studies in Immunization Against Tuberculosis, by Karl Von Ruck, M. D., and Silvio Von Ruck, M. D.

G. P. PUTNAM'S SONS. New York and London, 1916.

Physics and Chemistry for Nurses, by Amy Elizabeth Pope.

P. BLAKISTON'S SON & CO. Philadelphia, 1916.

The Treatment of Infantile Paralysis, by Robert W. Lovett, M. D.

LEA & FEBIGER. Philadelphia and New York, 1916.

A Manual of Otology, by Charles Edwin Perkins, M. D., F. A. C. S.

The Treatment of Diabetis Mellitus, by Elliott P. Joslin, M. D.

MISCELLANEOUS:

Monthly Bulletin of the Indiana State Board of Health. Indianapolis, May, 1916.

Quarterly Bulletin of the Louisiana State Board of Health. New Orleans, June, 1916.

Report of the Louisiana State Board of Medical Examiners on the Midwife Problem. New Orleans, La.

Bulletin of the Tulane University of Louisiana. The Register. 1915-1916. New Orleans, La.

Studies from the Institute for Medical Research, Federated Malay States. No. 13. **The Bacteriology of Dysentery in Malaya,** by Henry Fraser, M. D.

REPRINTS:

A Review of Current Periodicals by the Staff of the Research Department of the Severance Union Medical College, Seoul, Korea. Ralph G. Mills, M. D., Director.

Les Typhoides Intriquees, par le docteur **Arthur Grimberg.**

MORTUARY REPORT OF NEW ORLEANS.

Computed from the Monthly Report of the Board of Health of the City of New Orleans, for August, 1916.

Cause.	White	Colored	Total
Typhoid Fever	5	3	8
Intermittent Fever (Malarial Cachexia)	2	1	3
Smallpox	.....	.....	.....
Measles	2	.....	2
Scarlet Fever	1	.....	1
Whooping Cough	.....	1	1
Diphtheria and Croup	2	1	3
Influenza	.....	.....	.....
Cholera Nostras	.....	.....	.....
Pyemia and Septicemia	1	.....	1
Tuberculosis	45	49	94
Cancer	22	6	28
Rheumatism and Gout	2	.....	2
Diabetes	2	1	3
Alcoholism	2	.....	2
Encephalitis and Meningitis	2	1	3
Locomotor Ataxia	1	.....	1
Congestion, Hemorrhage and Softening of Brain	21	8	29
Paralysis	.....	1	1
Convulsions of Infancy	.....	.....	.....
Other Diseases of Infancy	15	8	23
Tetanus	1	.....	1
Other Nervous Diseases	5	1	6
Heart Diseases	43	37	80
Bronchitis	.....	.....	.....
Pneumonia and Broncho-Pneumonia	15	23	38
Other Respiratory Diseases	1	3	4
Ulcer of Stomach	2	.....	2
Other Diseases of the Stomach	1	2	3
Diarrhea, Dysentery and Enteritis	33	15	48
Hernia, Intestinal Obstruction	5	.....	5
Cirrhosis of Liver	6	7	13
Other Diseases of the Liver	5	5	10
Simple Peritonitis	1	.....	1
Appendicitis	4	2	6
Bright's Disease	18	21	39
Other Genito-Urinary Diseases	12	10	22
Puerperal Diseases	10	4	14
Senile Debility	.....	.....	.....
Suicide	3	1	4
Injuries	21	16	37
All Other Causes	21	16	37
Total	332	243	575

Still-born Children—White, 24; colored, 28; total, 52.

Population of City (estimated)—White, 276,000; colored, 102,000; total, 378,000.

Death Rate per 1000 per annum for Month—White, 14.43; colored, 28.59; total, 18.25. Non-residents excluded, 15.97.

METEOROLOGIC SUMMARY. (U. S. Weather Bureau.)

Mean atmospheric pressure 30.00

Mean temperature ..... 83.

Total precipitation ..... 4.89 inches.

Prevailing direction of wind, southeast.